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VIEWS, NEWS AND INTERVIEWS

It is remarkable how well the long-distance telephone fits into the various requirements of business and the numerous affairs of life. One day, not long ago, a prominent lawyer at Dallas, Tex., found that he had entirely forgotten to file a bill of exceptions in an important suit before the State Supreme Court at Austin, 200 miles away. He had about two hours, and, of course, even if he could have gotten to Austin in so short a time, he would have been too late and would have had no opportunity to prepare the document. The long-distance telephone and an expert stenographer at the Austin end were called into requisition, and within the specified limit of time the document was prepared and duly filed with the court.

A careful canvass of the leading wholesale houses of Chicago shows that the increase in the volume of trade in electrical supplies for this year over the total figures for 1898 is estimated at $3,000,000.

Henry Martens, the oldest conductor in the employ of the North Jersey Street Railway Company, died recently. He was 70 years old, and for more than 30 years never missed a day's run. He was known as Conductor No. 1, and, with Thomas Richards, another old employé, ran the Lafayette belt line, in Jersey City, N. J., which is known as the pension line.

A prominent official of the New York, New Haven & Hartford Railroad, when questioned the other day in regard to the report that the third-rail electric system is to be introduced for the traffic between New Rochelle and New York city, said: "Don't take any stock in that report."

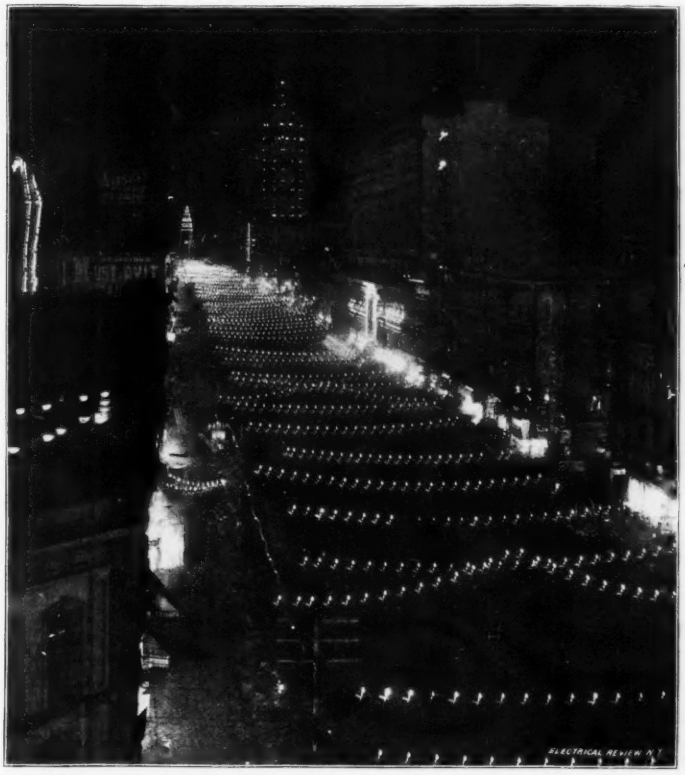
The most interesting incident in the Bates-Guild campaign in Massachusetts for the Republican nomination for Lieutenant-Governor was the recent announcement by one of Speaker Bates's lieutenants that he had hired all the electromobiles in Boston for use on caucus night, September 26. The cab company will have about a dozen vehicles in use by that time, but the Bates men say they would hire 50 if they could get them.

A daily newspaper states that Dr. Livingstone's grave in Africa is now marked by a "tall iron telegraph pole, carefully secured." The tree under which the explorer's heart had lain was rotting, so the section containing the inscription was cut out and shipped to the Royal Geographical Society, while in the center of the stump the telegraph pole was set.

The British Admiralty has decided to equip the "Defiance," the torpedo schoolship at Devonport, with a complete set of Marconi's wireless telegraph apparatus. Naval officers will be detailed to make further experiments.

A Handsome Electrical Display in San Francisco.

San Francisco has just seen a great electrical display, in celebration of the return of the First California Volunteers from the Philippine Islands. Market street, the principal thoroughfare of the city, was arched from the ferries to the City Hall, a distance of one mile and a quarter, with strings of incandescent electric lights, the total number being high in the thousands, as the strings were only a few feet apart. The electrical display was a feature of the three days' celebration, and it attracted a great deal of attention on the last night, when all the lights were burned from early in the evening until 1 A. M. Not less than 300,000 persons as spectators on the sidewalks and 25,000 persons who paraded were under the lights. At intervals along the line of march were large search lights mounted on high frames. The accompanying illustration gives an idea of the electrical illumination of Market street.



ELECTRICAL STREET ILLUMINATION IN SAN FRANCISCO, CAL.

THE AUTOMOBILE CLUB OF FRANCE.

BY FRANCIS P. MANN.

The history of this organization is intimately connected with that of the development of the automobile in France, which of late years has reached such an important point. The trials of speed which took place in 1894 from Paris to Rouen mark a period when the attention of the public was first attracted largely to this form of locomotion, and it was seen that the new vehicles, which were able to make without difficulty the long trip from Paris to Normandy, contained the germ of a revolution in means of transport, an amelioration of roads, and an increase in industrial, as well as social, interests. It was at that time that a nucleus of engineers, constructors and wealthy vehicle owners commenced to form a group which foresaw the great future which was in store for the new automobiles. When in 1895 the Count de Dion proposed a second demonstration of the value of the new method by a trial of speed from Paris to Bordeaux and back, a sum of 100,000 francs was raised within a few days, thus showing the enthusiasm caused by this subject. The success of these tests was great, and marked another important point in the history of the automobile. The public began to see that the new vehicle had come to stay, as was proved by the fact that in these tests an automobile could run without stopping for 48 hours, at a speed of 27 kilometres per hour. But it was necessary that there should be a united action among the promoters of the new system, that they should be brought into closer relations with each other, so as to act in common for the defence of their united interests against the regime of routine, which is always opposed to new enterprises.

It was the Count de Dion who first had the idea to found a club in which all these interests should be united, and which should carry on the work which had already awakened so much enthusiasm, and by means of which

the makers and owners of automobiles could unite, become acquainted and discuss their common interests. In October, 1895, he discussed the matter with Baron de Zuylen and M. Paul Meyau, and the foundations of the new club were laid. The Paris journal *Le Figaro* took an active interest in the formation of the new society, and helped to make it public. It will be interesting to quote what it said on that occasion, as it indicates clearly the purpose of the club, to which it holds at the present time:

"The new Automobile Club is not only a club properly so-called, as its title would seem to indicate, but rather an association for the encouragement and promotion of automobile affairs, whose headquarters will be fixed at Paris, with auxiliary societies and correspondents in the principal cities of France. At Paris will be located the building in which all the members may be united, and where also will be centralized all the documents and information relating to automobile matters, as well as the various technical committees, libraries, maps, etc, and where meetings of these different committees will be held, as well as of those whose duty it is to defend the cause of automobilism before the courts and legal powers. It will provide for the installation of special storage quarters in Paris and throughout the country, where its members will find all the resources desired; the club will remove all the inconveniences which are now encountered in this direction, and will have its engineers, mechanics, lawyers, etc. It will aid by its counsel and its support the municipalities desiring to establish services for the transportation of passengers or merchandise, and will endeavor to bring before the eyes of the public, through the agency of the press, the progress realized from time to time; it will organize expositions, competitive tests, races, etc."

The activity of the persons interested, aided by the influence of the *Figaro*, the *Locomotion Automobile* and other journals, soon put the club upon its feet. On November 12, 1895, the first formal meeting was held at the residence of the Count de Dion, consisting of 25 of the leading spirits, such as M. Marcel Deprez, Georges Berger, Baron de Zuylen, Clement, Dufayel, Jeantaud, Count de la Valette, de Lucenski and others. MM. Marcel Deprez and Berger were named honorary presidents, and the statutes were read and decided upon. The Council of Administration was constituted, with Baron von Zuylen as president, and Count de Dion and M. Menier as vice-presidents. The Count de la Valette represented the technical section. A commission was named to select suitable quarters, and these were found at No. 4 Place de l'Opera, consisting of a series of rooms including a library, dining-room, secretary's office, etc.

At the end of two years these quarters became insufficient, and the Hotel du Plessis-Bellière, on the Place de la Concorde, was purchased by a stock company, formed by several of the wealthy members, for 1,500,000 francs. This building is situated in the central part of the city, and is near the Champs Elysées and the boulevards. As the building was an old one it needed to be modified in the interior to suit the purposes of the club, and the work was given in charge of M. Rivier, the architect of the club and one of its influential members. The interior, as transformed, presents a handsome appearance, and one appropriate for the important position which the club now occupies. The building has five stories. The ground floor may be entered with vehicles by the porte-cochère, and in the rear are arranged suitable places for their storage, with special mechanics and inspectors to look after them and make repairs when necessary. On the ground floor are also the cloak-rooms, waiting and toilet-rooms. Two large staircases lead up to the second floor, in which are a vestibule, parlors, dining-rooms, bath-rooms and large galleries which may be used for exhibitions. The third story contains the reception rooms and those used for fêtes, banquets, congresses or general assemblies. On the fourth story are the rooms of the committee, offices, library, etc., and on the fifth, the billiard-rooms, dining-rooms, kitchens, etc. Above extends the terrace garden, with fountains and banks of plants and flowers. From this point one has a splendid view of the city, with the Chamber of Deputies on the opposite bank of the Seine, and the buildings of the exposition, which are now slowly rising in preparation for next year.

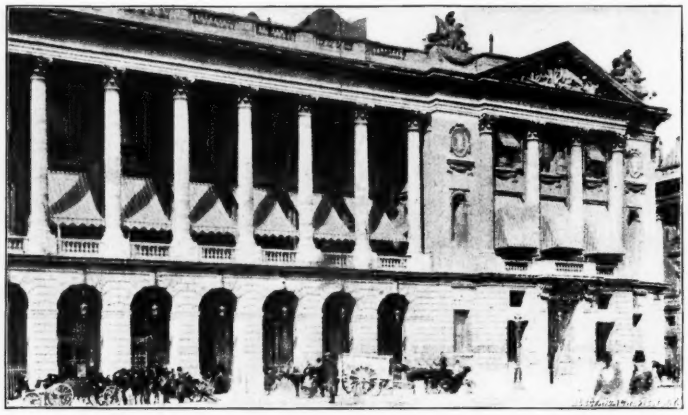


FIG. 1.—THE HOME IN PARIS OF THE AUTOMOBILE CLUB OF FRANCE.

In order to separate the technical part of the work from the social, a separate organization has been formed, most of whose members are also members of the club; this is called the Société d'Encouragement. This branch of the club has taken an active part in pushing all automobile affairs, and has organized exhibitions, competition tests, etc. The first annual exposition of automobiles was held last year in the month of August, and was an important event, serving to bring before the public the progress already made. All the leading types of electromobiles, such as Jeantaud, Krieger, Jenatzy, etc., were represented. About the same time a series of competition tests of automobiles was undertaken, in order to show in a practical way the capabilities of the new vehicles. They were made to run over a distance of 60 kilometres each day, for 10 consecutive days; the routes were laid out in the streets of Paris or in the suburbs. Some of the streets have very steep grades, especially in the quarter of Montmartre, where also the paving is an exception to the general good quality to be found in Paris. A technical committee was appointed by the club, under the direction of M. Forestier, to regulate the tests, examine the vehicles and make the final report. Each vehicle was accompanied by an expert who made the necessary observations, and in the case of the electromobiles took readings of the instruments to determine the energy consumed. In order to test the value of the electric and mechanical brakes the vehicles were made to run down a steep grade at full speed, and at the moment when the signal flag was lowered the brakes were put on, and the time necessary to come to a full stop was taken with a stop-watch; it was found that most of the vehicles could be stopped within a space of five to eight metres. The committee took all these notes, and after the tests were finished made out an official report in the name of the Automobile Club, which was presented to the Civil Engineers' Society of France. This year a similar series of tests has been made, and the vehicles make a better showing than last year's results. A greater number of electromobiles was entered this year and, in fact, took the prominent place in the tests; it was found that the electromobiles, as well as accumulators, have been greatly improved since last year. Most of them made the run of 60 kilometres in less than four hours, giving an average speed of 15 kilometres per hour.

Shortly afterwards the second annual exposition of automobiles was held, under the supervision of M. Rives. Two immense tents were erected for the purpose in the Gardens of the Tuileries, in the central part of the city. The exposition, by the number and variety of its exhibits, gave a striking example of the progress which has been made since last year, and shows the important place held by France in the automobile industry. Among the electromobiles the number of manufacturers is increasing, many of them saying they are receiving more orders than they can fill. The principal makes are those of Jeantaud, Krieger, Jenatzy, Mildé, Patin, etc. The American vehicles attracted favorable comment at the exhibition; there were represented the Columbia, Riker and Sperry types. Apropos of the exposition it will be interesting to quote the words of Baron de Zuylen at the annual banquet of the club recently held. After congratulating the club and members of the committee for the part they have had in the success of the exposition, which has so brilliantly marked the progress of the automobile industry, he gives some figures which show the progress made. Last year there were about 270 exhibitors, with a space of 4,880 square metres; this year there were 340, and the space occupied reached 10,000 square metres. He speaks of the astonishing progress of the automobile industry, with which the club has always been closely identified. Eight or nine years ago France

possessed less than a dozen constructors; now there are at least 600 constructors who have already produced 3,250 automobiles of all kinds, not counting the moto-cycles (tricycles operated by gasoline motors), which reach the ten-thousands. These results are encouraging when it is considered what an important part the club has taken in forwarding the movement. The progress made in the construction of the vehicles is very great. At the time of the famous Paris–Bordeaux trip in 1895, M. Levassor made the distance of 1,160 kilometres in 48 hours, and this was considered an astonishing performance. This year, in the tests of May 21, the same distance was covered in less than 11 hours. Two years ago, in the Nice–Turbie tests, the first arrivals made the steep ascent of 17 kilometres in one hour; this year 14 vehicles accomplished the same result in half the time. He states that some of the principal constructors have orders for automobiles which are two or three times as large as those for horse vehicles.

The club is now carrying out a series of competitive tests of accumulators, in order to determine which of the leading types is the best adapted for automobile work. M. Jenatzy has designed what he calls a "trepidateur" or "shaker"; it consists of a stationary four-wheeled wagon truck, rubber tired, which is caused to jump up and down by a mechanism worked by an electric motor, thus imitating the jar which the vehicle would experience on the road. The wagon body is replaced by a platform, upon which the accumulators are placed, each in its appropriate box. They are charged in series, after which they are discharged through a lamp-load, which is made to vary in each half hour from 10 to 100 amperes by a revolving commutator. At stated periods the voltage of each battery is measured, and if it fails to reach the required figure after four such measurements, it is excluded from the tests. Owing to the authority of the club a number of makers from different parts of Europe have sent their batteries to be tested, and side by side on the platform may be seen French, English, German, Austrian and Italian makes. The club expects to award diplomas or medals to the successful competitors.

Among the interesting events of this year may be mentioned the Tour de France, in which a distance of 2,300 kilometres was to be covered in eight stages. The members of the club were largely represented among the 49 competitors; of these, 19 were able to finish the distance. An important work is carried out by the legal committee, who act in concert with the Minister of Public Works for the establishment of road regulations for the circulation of vehicles in the city and upon the roads. In his valuable work, the "Handbook of the Automobilist" (Carnet de Chauffeur), the Count de la Valette gives a résumé of the rules which have been lately established, including measures of surety, permits and authorizations for conductors of automobiles, conduct and circulation of vehicles, etc.

The club has taken active measures to establish a series of charging stations throughout the country, and to draw up a map upon which the stations will be located; this information will be particularly valuable to conductors of electromobiles who wish to make a trip of any considerable length. A series of signals has also been erected along the principal roads, indicating the commencement of steep grades or bad places, etc., so that, when going at full speed, accidents are not likely to occur. A series of sign-cards has been distributed by the club among the different repair shops, hotels, etc., along the routes, in order to indicate to the members the best places for storage, repairs, hotel accommodations, photographic dark-rooms, etc.

In the future, when a grave accident of any kind has been caused by an automobile, the club will send an expert on the ground at once, who will inspect the ground and the vehicle, take testimony, and inquire into the facts of the case; he will then make out a report for each case, in which the real responsibility for the accident will be determined as nearly as possible; this will be of great service to the members in cases where an accident is followed by legal proceedings, and will ensure their protection.

The club has also commenced the work of standardizing certain parts of automobiles, in order that they may be easily and quickly replaced when making an extended tour. A committee has been appointed to standardize, as nearly as possible, the transmission chains by adopting a series of definite sizes, so that, when a chain is broken en route, it will not be difficult to find another and replace it.

Baron de Zuylen. Comte de Dion. Comte de Chasseloup-Loubat.

Fig. 2.—The Moving Spirits of the Automobile Club of France.

Following the example of the Automobile Club, a number of similar organizations have been formed in the various cities of France and Europe. Among the former may be mentioned those of Bordeaux, Dijon, Nice, Lyons, etc., and among the latter the clubs of England, Austria, Switzerland, Italy and Belgium.

Report of the Committee on Standards of Measurement.*

The last report of this committee related to the redetermination of the electrochemical equivalent of silver by Drs. Patterson and Guthe by means of a specially constructed electrodynamometer. The result was 0 0011192 gramme per ampere per second. During the past year the same electrodynamometer has been employed in making an absolute determination of the electro-motive force of the Clark standard cell.

Two cells were made by the secretary of this committee in accordance with the specification which has been legalized in the United States. The two were made at an interval of a year, but at the same temperature they do not differ more than one part in 10,000.

The method adopted in measuring their electro-motive force was to compare the electro-motive force of the two in series with the fall of potential over the resistance of a coil of manganin wire immersed in paraffin oil, when the current through it balanced the torque of the phosphor-bronze wire of the electrodynamometer when twisted through one complete turn. The comparison was made by applying the Poggendorff method to the cells and to the potential difference between the terminals of the manganin coil in succession. Since the resistance of the manganin coil is involved in the measurement, it must be known with accuracy; for this purpose two standard one-ohm coils were ordered from Wolf, of Berlin, with certificate from the Reichsanstalt. These coils arrived in June.

Three independent comparisons were made with the cells at 15 degrees centigrade. The temperature was measured by immersing the cells in a bath of petroleum and taking the temperature by means of a thermometer made by Haak, of Jena, reading to fiths and calibrated at the Reichsansalt. Its number is 11,021, and at 15 degrees it reads 0.05 degree too low.

The result of the three measurements is 1.4333 volts at 15 degrees. Glazebrook and Skinner, by the silver voltameter method and assuming 0.001118 as the electro-chemical equivalent of silver, obtained 1.4342. Kahle found, by means of a Helmholtz electrodynamometer, 1.4338. His value of the silver equivalent is 0.0011182. But Kahle says that silver nitrate neutralized by silver oxide gives a larger value for the electro-chemical equivalent by five parts in ten thousand. Neither Kahle nor Glazebrook appears to have employed the neutralized silver nitrate solution. The value 0.0011192 was obtained by the use of the neutralized solution. Hence the silver equivalent for the solution used by Glazebrook equals 0.0011187. Assuming this value instead of 0.001118, Glazebrook's result is reduced from 1.4342 to 1.4332. This is practically identical with the value now reported by the secretary of this committee and Dr. Guthe, which is 1.4333.

Henry S. Carhart,
Secretary Committee.

*From Proceedings American Association for the Advancement of Science.

SCIENCE BREVITIES.

Electrical Ignition of Fire-Damp—The result of experiments on the ignition of fire-damp and coal dust by means of electricity were given in a paper by Herr Heise and Dr. Theim, recently read before the Institution of Mining Engineers, says the *Engineering and Mining Journal*. The sum of the results obtained show that in general the amount of electrical energy capable in certain circumstances of igniting fire-damp need be extremely small. This amount can not be definitely fixed, however, as it depends not only on the quantity of energy, but on the mode of its application and other attendant circumstances. In any case, all visible sparks may be looked upon as dangerous. Explosions of coal dust alone appear to be impossible of production by electricity, unless special classes of coal dust behave differently from those tried.

Viscosity—A discourse, given by Prof. H. S. Hele-Shaw at the Royal Institution seven months ago, on "The Motion of a Perfect Liquid," has at last, after many retardations and eddyings, trickled through to the press, says our London namesake. We are first shown diagrams representing the stream lines in the case of water passing through channels of various forms, and the tumultuous conditions under which water moves when it has to dodge through sluices, or along narrow river beds. The effect of a widening in the waterway is next discussed, the inertia of the particles is considered, and we are led to see that the impact of the particles in the wider portion necessarily involves greater pressure in that part. By introducing coloring matter or air-bubbles into the water, bands appear, whose widths indicate the local velocities and pressures. Having then determined the pressure at every point of the liquid, the directions in which the particles are moving, and their velocity at every point, we may know, or may think we know, all about its motion. Unfortunately, at this juncture viscosity comes into the problem, and hence arise immense differences between the flow of an actual liquid and the behavior of a so called "perfect" liquid. Viscosity turns out to be the cause of half the troubles and all the sea-sickness of the universe, but with some compensations. If there were no viscosity there would be no waves raised by the wind, there would be no tidal flow, rivers would move with incredible velocity, and rain would fall in one big unhesitating drop.

Enclosed Arc Lamps—Although enclosed arc lamps are in so general use, experts agree to differ as to the light produced for a given consumption of energy. The most recent tests were made by MM. E. Gerard and de Bast, and were published in the *Bulletin de l'Institut Montefiore*. These experimenters used an enclosed arc lamp taking 4½ amperes at 108 volts. They measured both the mean spherical illumination given and the mean illumination of the lower hemisphere. In the first case they found that the lamp took about 2.9 watts per mean spherical candle-power, and in the other about 2.45 watts per candle. They argue, therefore, that the enclosed arc lamp has very little advantage over an incandescent lamp taking three watts per candle. The results so obtained do not agree at all with other tests made in the United States on the same subject, and it would be interesting to know how long the lamp had been working before the candle-power was measured. It is very important with these enclosed arcs that the inside globe be kept free from deposit.

The Electrolytic Refining of Auriferous Silver—Herr Dietzel, in a paper read before the German Electrochemical Society, states that an instance of the most simple case of the electrolytic decomposition of alloys is as follows: If the anode consist of silver containing gold, and an acid solution of silver nitrate is used as an electrolyte, silver is traveling to the cathode, and the same quantity is being added to the electrolyte at the anode; the gold remains at the anode, and the electrolyte is not altered. Most of the practical cases in the electrolytic refining of metals are, however, much more complicated, as at the anode, besides one part of the anodic material dissolving, the other part is altered chemically, forming combinations with the elements of the electrolyte; in this case the electrolyte is also altered. If the combination formed at the anode is soluble in the electrolyte, the whole metallic concentration of the electrolyte is not altered, but the percentage of each of the metals is. The percentage of the metal deposited at the cathode decreases in the electrolyte and the percentage of the other metal increases, the sum of all the percentages being unchanged. If the anode is silver containing considerable copper, and silver is intended to be deposited at the cathode, the silver percentage of the electrolyte decreases and the copper percentage increases to such a degree that it would soon be impossible to deposit pure silver at the cathode. If, therefore, a silver salt requiring a lower decomposition pressure is used as the electrolyte, the assistance of some auxiliary chemical process becomes necessary to diminish the increasing copper percentage and to increase the diminishing silver percentage in the electrolyte. Instead of this, it is much more convenient to use the salt requiring the higher decomposition pressure as the electrolyte, to deposit copper at the cathode, and to replace the silver which is dissolved at the anode, by an equivalent quantity of copper in a special process, before the copper is deposited at the cathode. In this case the composition of the electrolyte remains nearly unaltered. This method has been successfully used for more than six years at Pforzheim, Germany, where about 60 kilograms of an alloy is decomposed per day. This alloy, consisting of fused wastes, contains 40 to 65 per cent copper, 22 to 50 per cent silver, 5 to 7 per cent gold, and small quantities of other metals. A slightly acid solution of copper nitrate is used as electrolyte. At the anode copper and silver are dissolved; copper is deposited at the cathode, the gold remains undissolved, and the silver is recovered in another tank by special process, which is described. The current is about 150 amperes per square meter at 2½ to 3 volts The cost of the process is covered by the value of the refined copper. He thinks that the same method can be used for decomposing other alloys, as, for instance, refining nickel and copper.

Artificial India Rubber—The *Kew Gardens Bulletin* contains an article on Dr. Tilden's "Artificial Production of India Rubber," and quotes from his paper on the "Spontaneous Conversion of Isoprene into Caoutchouc," read before the Birmingham Philosophical Society.

India rubber, or caoutchouc, is chemically a hydrocarbon. But what is called its molecular constitution is unknown. All that has been ascertained is that when decomposed by heat (distillation in closed vessels) it is broken up into simpler hydrocarbons, amongst which is isoprene. Isoprene is a hydrocarbon which was discovered by Greville Williams many years ago among the products of the destructive distillation of india rubber. Later, in 1884, it was observed by Dr. Tilden among the more volatile compounds obtained by the action of a moderate heat upon oil of turpentine and other terpenes. It is a very volatile liquid, boiling at about 36 degrees. Its molecular formula is C_5H_8, and it forms a tetra-bromide, $C_5H_8Br_4$, but no methylic derivatives like the two homologues of acetylene.

Bouchardat observed that when isoprene is heated to a temperature near 300 degrees, it gradually polymerizes into a terpene, which he called diisoprene, but which is now called dipentene. This compound boils at 176 degrees. A quantity of colophene, similar to that which is produced by the action of heat upon turpentine, is formed at the same time. When isoprene is brought into contact with strong acids, aqueous hydrochloric acid for example, a small portion of it is converted into a tough elastic solid, which has been examined by G. Bouchardat and by Dr. Tilden. It appears to be true rubber.

Specimens of isoprene were made from several terpenes in the course of Dr. Tilden's work on those compounds, and some of them have been preserved. He was surprised at finding the contents of the bottle containing isoprene from turpentine entirely changed in appearance. In place of a limpid colorless liquid the bottle contained a dense syrup in which was floating several large masses of a solid of a yellowish color. Upon examination this turned out to be rubber.

The artificial rubber, like the natural product, appears to consist of two substances, one of which is more soluble in benzene or carbon bisulphide than the other. A solution of the artificial rubber in benzene leaves on evaporation a residue which agrees in all characters with a similar preparation from Para rubber. The artificial rubber unites with sulphur in the same way as ordinary rubber, forming a tough elastic compound.

The constitutional formula of isoprene is now known to be:

Methyl-crotonylene, $CH_2=CCH_3-CH=CH_2$.

In a recent letter Professor Tilden states: "As you may imagine, I have tried everything I can think of as likely to promote this change, but without success. The polymerisation proceeds very slowly, occupying, according to my experience, several years, and all attempts to hurry it result in the production, not of rubber, but of 'colophene,' a thick sticky oil quite useless for all the purposes to which rubber is applied."

Professor Forbes on Niagara Falls Development.

Prof. George Forbes, the well known English electrical engineer, has written the following letter from Niagara Falls, N. Y., to the London *Times:*

It was with unmixed pleasure that I have been able to pay a long promised visit to Mr. W. B. Rankine, one of the vice-presidents of the Niagara Falls company, to see how the commercial developments at Niagara were progressing, and I believe that a concise statement may be of interest to your readers. In June, 1892, and again in December, 1894, when the first works were nearing completion, I gave the *Times* some account of what was being done, and since then the public has taken much interest in similar electric developments of water-powers.

It is four years and a half since I was last here, and the first thing to strike one is the great number of enormous new factories which have been established on the company's land. Nearly every one of these consumes a very large amount of power, as is shown by the following statement, which any one can verify, showing the names of the factories and the amount of power used in each:

	Horse-power.
International Paper Company	7,200
Pittsburgh Reduction Company (aluminum)	3,050
Carborundum Company	1,600
Buffalo & Niagara Falls Electric Light Company	500
Electro-Chemical Company (peroxide of sodium)	400
Buffalo & Niagara Falls Electric Railway	200
Niagara Falls & Suspension Bridge Railway	250
Buffalo & Lockport Electric Railway	350
Oldbury Electro-Chemical Company	1,000
Mathieson Alkali Works	2,000
Cataract Power and Conduit Company (Buffalo)	8,000
Tonawanda Power Company	500
Union Carbide (of Calcium) Company	10,000
Surface Coating Company (enamelling)	20
Niagara Development Company (workmen's dwellings)	75
Niagara Waterworks	45
Total	34,590

To these additions are to be made in October, and two new works, the Atchison Graphite Company and the Lead Reduction Company (Litharge), will be supplied, bringing the total up to 45,190 horse-power contracted for, bringing in an income of over £150,000. The operating expenses do not exceed £25,000 per annum.

This is a most interesting result in three ways: (1) It shows that the original promoters were right in believing that the locality, with cheap railway transport, was favorable; (2) it shows that the general plan of the works, by which any customer could have any kind of electric current he desired, has been appreciated; and (3) it gives an indication of the enormous strides which have been taken of late years in electro-chemical and metallurgical processes.

Regarding the machinery, the dynamos, which were totally new, not only in size, but in their general design, never give the slightest trouble, and the transformers, ranging up to 2,500 horse-power, have answered their purpose perfectly, even with the low frequency of alternations, which was generally condemned by theorists when I introduced it, but which is recognized now by every one at Niagara as contributing largely to the success of the scheme. The rotary transformers for converting alternating into continuous current, which are used for nearly half of the power, gave some trouble at first, being the first which had ever been commercially used. But the difficulties have been successfully met. A good deal of the other machinery was of a new character and bold in design, but has generally worked well. The setting up and working of the transmission line to Buffalo reminds one of the earlier electric light stations in the United States, but this is bound to be one of the most important applications in the future.

The general conclusion arrived at, after thoroughly inspecting everything under the best auspices, is that the boldness of the originators of the scheme has been justified, and that the wants of manufacturers who require power in any form can be supplied. It must be remembered, however, that much depended upon the favorable locality, and this warning may be given, that it would be rash to develop a large water-power in this way without demands for power. At the inception of all these schemes there is one thing more important than overcoming the engineering difficulties, and it consists in ensuring the support of those who require large quantities of power, electrical or mechanical.

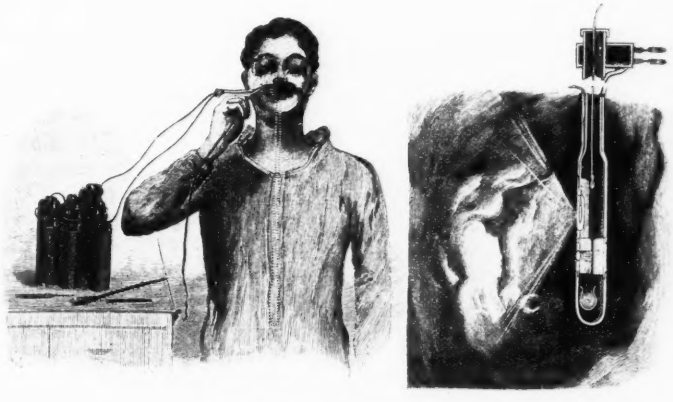
AUTOMOBILE NEWS.

A large biscuit manufacturing company in Boston has adopted electromobiles, for the delivery of their goods in and about the city.

The Barnes Cycle Company, of Syracuse, well known as manufacturers of the Barnes "White Flyer," have just completed a light electric carriage, seating two persons.

Photography of the Stomach.

Dr. Max Einhorn, of New York city, made a communication to a medical journal some seven years ago regarding "gastrodiaphany," in which a miniature Edison lamp in a special mounting, attached to a soft rubber tube containing a wire, was introduced into the stomach, so that an examination can be made of it. This method was called "gastrodiaphany," as the stomach became translucent. The object of this device was to show the size and situation of the stomach to the eye, and also to recognize tumors or other gross anatomical changes of the anterior wall of the stomach. This was, of course, a different apparatus from the "polyscope," which is used for looking into the stomach, and was not intended to replace any such device. It has been found to be of considerable value to surgeons. In the same paper Dr Einhorn described a camera for photographing the interior of the stomach, but, owing to technical difficulties, the camera was not constructed by Dr. Einhorn. Such a camera has, however, been perfected by Dr. Fritz Lange, of Munich, Germany, on almost the identical lines given by Dr. Einhorn.



PHOTOGRAPHY OF THE STOMACH.

Through the courtesy of Dr. Lange the *Scientific American* has published the accompanying accurate illustration of the device employed. The camera is a marvel of compactness, and is constructed on exactly the same principles as all cameras for taking moving photographs, although, of course, there is no attempt made to combine them so as to project the actual operations of the stomach. The camera itself is swallowed by the patient, and it contains a small electric lamp for illuminating the walls of the stomach. A photographic film twenty inches long and a quarter of an inch wide is wound at the bottom of the camera. One end of the film is fastened to the cord, which runs freely in the tube. When the cord is pulled the film is drawn slowly past the lens. The cord and the conducting wires must, of course, be swallowed with the camera itself. When the camera reaches the bottom of the stomach the surgeon begins to pull the cord, which runs the film past the lens. The electric light is then turned on, and after the sensitive film has been impressed with the image, the current is turned off and another section of film is brought into play until the requisite number of pictures have been obtained; then the entire apparatus is withdrawn from the stomach of the patient, and the films are carefully developed and enlarged.

Electric Tramways in China.

The announcement that the first electric tramway in China has been opened for traffic, between the Pekin railway station at Machiapu and the South Gate of the capital, is important as well as interesting. The distance covered is not great, being only about four miles, but, says the London *Standard*, a western object lesson of this sort, brought almost within the sacred precincts of the Pink or Forbidden City, and under the personal cognizance of the Son of Heaven, can not but impress the anti-foreign element in the Chinese Government. It is not so long since the railway connecting Pekin with Tientsin and the sea was thrown open to traffic, and travelers testify that it is now eagerly patronized, not only by the lower and middle-class natives, but by the very mandarins and dignitaries who so long opposed its introduction. But the engineers were forbidden to approach the vicinity of the metropolis with their foreign devilries, and were compelled to build the terminus four miles distant from the walls of Pekin. It was declared that the Emperor's gaze could not be profaned with the smoke of the locomotive, and, furthermore, that the Feng-shin, or Spirits of Water and Air, would be incensed thereat. The railway projectors have rather cleverly taken advantage of the loop-hole in these objections. They represented with plausibility that, under these circumstances, an electric tramway could offend neither celestial nor Imperial susceptibilities, and they eventually succeeded in getting their own way. The tramway was opened in the presence of the Chinese Directors of the Imperial Railways of North China and six ministers of the Tsung-li-Yamen, who were deeply interested in inspecting the plant and watching the proceedings.

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NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week, although it is occasionally possible to get in matter received on Monday.

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Notwithstanding the fact that the telephone in its present state of development affords, in many instances, a perfectly satisfactory service to the subscriber, there are many important problems in telephone engineering yet unsolved. This leads naturally to the inquiry: Why are there so few really competent telephone engineers? It is a most attractive field of work and offers certain rewards to those who enter it with a proper knowledge of their profession.

The people of New York city are given to celebrating events of importance. We respectfully suggest that the departure of the last horse car from the streets of the greatest city in the United States be made the occasion for fitting ceremonies. It may be a year or more before the festal day arrives, but there's nothing like getting ready in time. Doubtless the railroads might arrange for excursions from surrounding cities so that their inhabitants could be on hand to swell the multitude. Such a celebration would surely be a treat to residents of smaller cities who have forgotten what a horse car looks like.

It has been the fashion ever since the dawn of history for rich men to keep horses for the pleasures of riding and driving. Another sign of the emancipation of the horse is that wealthy men now keep stables of automobiles. The automobile is, just now, the fashion, and it is a little curious to note that, for once, fashion and common sense go hand in hand. However desirable the horse may be as an accessory of pleasure, he is certainly an unpleasant neighbor in the close quarters of modern cities. Furthermore, he is, at times, unreliable, and he engenders flies. The automobile is safe and gentle, flyless and odorless, and warranted not to shy or kick.

The interesting experiments of Dr. Cunningham upon animals apparently killed by electric shock, which are described in another column, and the conclusions to which they irresistibly lead are of deep interest. They should be of special interest to those legislators who have adopted electric shock as the legal method of execution. If it is admitted that Dr. Cunningham's conclusions are correct, it will be seen at once that the ghastly ceremony of "electrocution" does not result in an instantaneous and painless death; it is not certain that the executed person is even unconscious. If these experiments lead to a revision of the methods of execution in New York and Ohio, they will accomplish a most desirable and humane end.

The growing interest in automobiles in this country has resulted in a rather amusing coincidence—the announcement of the appearance of no less than three monthly publications named *The Automobile*. One of these makes its appearance, consisting of forty pages of miscellaneous misinformation. Among other things it contains a list of automobile manufacturing companies and the amount for which each is capitalized. In this is included a total of nine concerns that are about to build "air-power" automobiles, with a combined capitalization of $64,690,000. Of these three are "autotruck" companies and two are "liquid air power" concerns. One of the latter, capitalized at $5,000,000, advertises that it can make five horse-power from two, and that it can turn out a gallon of liquid air for one cent, presumably using the power it makes out of nothing.

The ordinary electrical text-book expresses itself mostly through the medium of formulæ. To the average man an algebraic formula is more or less of a puzzle, a thing of strange portent. Even if he knows something of the elements of mathematics he is apt to think that some dark mystery is wrapped up in x and y—and this is solely because the usual teaching of the subject in schools is bewildering and illogical. One has to be, under the ordinary curriculum, something of an adept in mathematics to know that nothing ever comes out of an algebraic expression that is not put into it. There is no juggling in an equation. The symbolic expression is only a language into which one translates a concrete idea for the purpose of more easily thinking about it. The whole of mathematics is merely mental shorthand, but this fact is almost never taught to students of the subject. Hence, probably, the fear of formulæ, and also the folly of expressing in mathematical symbols anything that possibly can be set forth in any other way. Until a knowledge of the essential nature of the symbolism of mathematics is far more widespread, the writer upon technical matters will err in clothing his thought in incomprehensible formulæ.

THE PARIS EXPOSITION OF 1900.

Many American manufacturers, especially those interested in electrical matters, have either already started upon the preparation of exhibits for the exhibition in Paris next Summer or are now maturing plans for the same. The consensus of opinion seems to be that it is wise to stop all preparation in view of the remarkable political situation in France at the moment. In a country where personal liberty is at the mercy of a hysterical military clique, and where there is no guarantee of safety for either person or property, and, furthermore, where there is the immediate likelihood of bloody revolution, it is not considered safe by the thinking class of manufacturers in this country either to exhibit or to attend the exposition. So far, indeed, has this feeling of contempt and disgust for French institutions permeated the people of this country that it is exceedingly unlikely that there will be anything like a representative exhibit made by American manufacturers. It is practically certain to-day that British, German, Austrian and Italian manufacturers will be ruled by the same considerations. In fact, it is by no means certain that there will be an exposition. The feeling is general that in a country that can not guarantee its own citizens justice in its courts, military or civil, and in which an intense hatred to all foreigners is manifest, there will be no safety for either the person or property of a foreigner. While it is possible that a successful exposition in Paris, similar to those that have been held in the past, would be of considerable benefit to the export trade of the United States, it is certain that persistent effort along the usual lines of business expansion will be more satisfactory, and, in the present state of French public sentiment and politics, infinitely safer.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES.

FIFTEENTH ANNUAL MEETING HELD IN PHILADELPHIA.

The fifteenth annual meeting of the Association of Edison Illuminating Companies convened at the Lafayette Hotel, Philadelphia, on Tuesday morning, September 12, and will continue on September 13 and 14. In the absence of the president, Mr. R. R. Bowker, of New York, Vice-President George R. Stetson, of New Bedford, presided. At the opening session the meeting listened to the report of the Lamp Testing Bureau for the year ending April 30, 1899, and to a paper on "The Renewal of Lamps," by Mr. F. W. Willcox, of the General Electric Company. Mr. R. R. Bowker was elected an honorary member of the association.

The following new members were elected: Edison Electric Company, Altoona, Pa.; Amsterdam Street Railway Company, Amsterdam, N. Y.; Edison Electric Illuminating Company, Baltimore, Md.; Chester Electric Light and Power Company, Chester, Pa.; Jackson Light, Heat and Power Company, Jackson, Mich.; Edison Electric Illuminating Company, Tamaqua, Pa.

Among those present were the following gentlemen: H. A. Wagner, St. Louis, Mo.; Joseph B. McCall, Philadelphia; G. Medici, Milan, Italy; J. T. Maxwell, Philadelphia; A. F. Walker, Grand Rapids, Mich.; E. D. Mullen, Philadelphia; Hoyt Post, Detroit; Guiot Semenza, Milan, Italy; Henry W. Darling, Des Moines, Iowa; J. H. Vail, Philadelphia; H. J. Hartman, Scranton, Pa.; T. E. Crossman, New York city; A. J. De Camp, Philadelphia; J. M. Eglin, Philadelphia; W. J. Lockhart, Newark, N. J.; W. S. Barstow, Brooklyn, N. Y.; Edwin R. Weeks, Kansas City, Mo.; R. S. Hale, Boston; Louis A. Ferguson, Chicago; H. T. Edgar, Brockton, Mass.; J. W. Lieb, Jr., New York city; A. S. Knight, Boston; W. H. Atkins, Boston; W. H. Johnson, Philadelphia; C. R. Price, New Bedford; J. G. Rossman, Minneapolis, Minn.; J. W. Ellard, Baltimore; Leon H. Scherck, New Orleans; F. M. Noecker, Renova, Pa.; F. P. Spiese, Tamaqua, Pa.; H. C. Fogle, Canton, Ohio; W. J. Kehl, New Orleans; Fred M. Kimball, Boston; B. E. Sunny, Chicago; Charles T. Hughes, New York; E. H. Mullin, New York; George A. Redman, Rochester; F. W. Willcox, Schenectady; F. E. Barker, Boston; D. L. Huntington, Spokane, Wash.; W. S. Smith, Toledo; Alex. Dow, Detroit; Daniel McCoy, Grand Rapids, Mich.; Ch. Wustenfeld, Elgin, Ill.; A. W. Field, Columbus, Ohio; Charles F. Wallace, Brockton, Mass.; A. M. Robertson, Minneapolis; C. C. Perry, Indianapolis; William Chandler, Sault Ste. Marie, Mich.; C. L. Edgar, Boston; Luther Stieringer, Kansas City, Mo.; A. H. Manwaring, Philadelphia; John T. Gilchrist, Chicago; F. R. Jenkins, Chicago; E. B. Greene, Altoona, Pa.; George R. Stetson, New Bedford, Mass.; Wilson S. Howell, Newark, N. J.; H. G. Scott, Buffalo; Caryl D. Haskins, Schenectady; C. P. Steinmetz, Schenectady.

The meeting is well attended, and promises to be a successful one. The delegates and ladies in the afternoon visited the battle-ships in the harbor and Cramp's shipyards, taking carriages to a special steamboat.

Old Time Telegraphers' Meeting.

The nineteenth annual reunion of members of the Old Time Telegraphers' Association and the United States Military Telegraphers' Corps began in Boston on Tuesday, September 12, with members present from all parts of the country. The business session of the former was held in the morning, with Mr. H. J. Pettingill presiding. Mayor Quincy welcomed the association, which afterward made him an honorary member.

Who Makes the "Teletype?"

TO THE EDITOR OF ELECTRICAL REVIEW:

If not asking too much will you kindly inform me of the name of the manufacturer of a machine called the "Teletype?"

Also whether it has both an upper and lower case same as an ordinary typewriter, and whether they are in practical use to any great extent?

Very respectfully,

J. CHARLES BRENIZER.

Harrisburg, Pa., September 6.

Reporting the Dreyfus Trial.

A newspaper cablegram from Rennes, France, asserts that during the Dreyfus trial between eight and nine million words were sent from that place by telegraph. The telegraph tolls amounted to $90,000. After the verdict and sentence were announced 3,000 direct telegrams were sent.

It is announced that Signor Marconi will come to the United States, with a complete outfit of wireless telegraph apparatus and several assistants, to report the "Columbia–Shamrock" races in October for the New York *Herald*.

An American Firm Purchases Indian Coins for Copper Scrap.

In the ELECTRICAL REVIEW for August 2, 1899, the fact was mentioned that a copper company in New York city had received a consignment from India of 9,999 bags of copper coins which had been purchased for their intrinsic value as copper scrap. An occurrence so unusual and which only could happen in the present state of the copper market is worthy of more than passing comment. Therefore the ELECTRICAL REVIEW presents the following facts in regard to this curious transaction:

The president of the Orford Copper Company, of 99 John street, New York city, heard of an opportunity, through the company's representative in Bombay, India, of buying 254 tons of Indian copper coins which had been retired from circulation. The

OBVERSE AND REVERSE OF AN INDIAN COPPER COIN; 254 TONS OF THESE WERE BOUGHT BY AN AMERICAN FIRM FOR THEIR SCRAP COPPER VALUE.

price paid was the prevailing market price for scrap copper. The purchase was made, and the coins were shipped in double gunny-sacks, each containing 56 pounds of coin, making 9,999 bags, or 254 tons. The bags were shipped from Bombay to Liverpool, whence they were transshipped to New York. Not a single bag was broken in transit, and the coins arrived in good shape as expected.

Each coin has a currency value of one-third of an anna, equal to a little less than ⅓ cent—0.3125 cent to speak accurately. The coins contain eight ounces of silver to the ton, and each one weighs nine pennyweights; consequently, their value as copper is larger than as currency, being at prevailing prices 0.49 cent each. An illustration of the obverse and reverse of one of these coins is presented herewith.

Shortly after the civil war in the United States a large quantity of the old-fashioned, large, copper cents were bought by copper dealers as scrap copper, this being, probably, the first time that coins were used for such a purpose. In this connection, it is interesting to note that the English farthing, worth about one half cent as coin, if many are still circulating, is probably more valuable to-day for the copper it contains than as currency. The search for copper in all forms is likely to bring forth even more unexpected stores of that metal than that here illustrated.

NEW YORK STATE STREET RAILWAY MEETING.

CONVENTION OF THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, AT ITHACA, SEPTEMBER 12 AND 13.

On Tuesday, September 12, the Street Railway Association of the State of New York met at Ithaca for its seventeenth annual convention, under the presidency of Mr. G. Tracy Rogers. Magnificent weather added to the charm of the picturesque town, and the meeting opened with an interested attendance of gratifying proportions.

The meetings of this association differ from those of most other similar bodies in not having a formal programme of papers. Instead, topics for discussion are introduced, and members are limited to twelve minutes' time in speaking upon them.

The exercises were opened with the annual address by President Rogers. He spoke of the great advancement of street railway development during the past year, of the success of the underground trolley system and the growing use of aluminum conductors.

He believed that the public had been benefited through every consolidation of street railways, and that, therefore, the clamor against trusts should not apply to street railways. Mr. Rogers believes that the bicycle would be continued as a convenience, but its use as a pastime is on the wane. He thought, however, that the possibilities of the automobile's practicability in the line of cabs, omnibuses, etc., must be regarded by street railway men with attention but without concern. He thought that it had been demonstrated that it would be unwise to place the control of a city's transportation agencies in other than private hands, and said that municipal ownership had received some severe blows of late.

On Tuesday evening the customary banquet, which is always one of the most pleasant features of these occasions, was served, to the great enjoyment of the numerous members and guests who attended it.

A number of interesting excursions to points in the picturesque and beautiful environs of Ithaca were organized by the Ithaca Street Railway Company, and included "trolley rides," a boat trip on Cayuga Lake, during which luncheon was served on the boat, and a band concert at Renwick Park. The buildings of Cornell University were thrown open to the visiting railway men, and the professors of that institution gave highly instructive explanations of the various features of the electrical and other laboratories, which were greatly appreciated.

The meeting was highly successful, and was much enjoyed by all those who had the good fortune to be present.

DARK LIGHTNING.

BY PROFESSOR R. W. WOOD, IN "SCIENCE."

I have been greatly interested by some photographs showing the rare phenomena for dark lightning, which have recently been sent to me. So far as I know, the only explanation that has ever been offered to account for them is photographic reversal, due to extreme brilliancy. This appears to me to be wholly out of the question for two reasons. In the first place, a dark line on the picture, resulting from over exposure of a very brilliant line, would be surrounded by bright edges, due to the lesser photographic action in the halation region. This is never present, so far as I know, the dark flashes being minute dark lines ramifying from or in the neighborhood of the main discharge. Secondly, from what evidence I can gather, the dark parts of the flash are not those which appear most brilliant to the observer. Mr. Jennings, of Philadelphia, who, in 1890, secured a remarkable picture, reproduced in *Photographic Times Annual* for 1891, showing a very brilliant flash with countless dark flashes covering the sky around it, tells me that the appearance to the eye was a brilliant white discharge, with fainter rose-colored ramifications, the latter developing in the negative, or rather positive, as dark flashes. Some years ago it occurred to me that a dark flash might be produced by a preponderance of infra-red radiations, which, as Abney has shown, undo the work of ordinary light on the plate. If we had a form of discharge capable of giving off very little actinic light, and an abundance of infra-red light, it might come out dark on a feebly illuminated background. This is, of course, a very wild guess, with nothing to substantiate it, but the dark flash appears to be a reality, and a poor hypothesis is perhaps better than none at all.

I have recently thought that the phenomenon might perhaps be explained in another way. We have a flash which appears darker than the sky behind it. It is inconceivable that the discharge could render the air in its path opaque, in the ordinary sense, to white light. But the light which illuminates the sky in the case of these pictures is not daylight, but light coming from another flash, that is made up of wave-lengths corresponding to the periods of vibration of the dissociated matter in the path of the discharge. Now, may it not be possible that in the dark flash we have a discharge, weak or nearly wanting in actinic light which, however, renders the air in its path capable of absorbing to some extent the radiations of the wave lengths which come from the bright flash. Such a flash might possibly appear dark on a background feebly illuminated by light exclusively of these wave-lengths.

In other words, may we not have in the path of the dark flash dissociated molecules, radiating but feebly, and capable of taking up vibrations of periods similar to their own, coming originally from a simultaneous brighter discharge?

It might not be impossible to reproduce the phenomenon by photographing a spark in front of a white background in an absolutely dark room. Sparks are almost always taken against a dark background, which would account for the absence of dark flashes in pictures of artificial discharges. A heavy main spark, with lateral branches, would seem the most suitable kind to employ.

The best method, however, of attacking the problem experimentally, it seems to me, would be a search for selective absorption in a partially exhausted tube. If the source of light were continuous any absorption would be unnoticeable, unless it persisted for some time after the discharge (which is unlikely), for the time between successive discharges is very great in comparison to the actual duration of one of them. Even in the case of so-called continuous discharges produced by high-potential storage batteries the discharge is often, and may always be, intermittent in character. The source of light should then be of no longer duration than the discharge occurring in the gas, the absorption of which is to be examined.

I can think of no way of producing a white or continuous spectrum source of as short duration as, and contemporaneous with, the discharge in the tube, but by employing two tubes differently excited, the one as a light source, the other as an absorption tube, some results might be obtained. Professor Trowbridge found that an argon tube emitted a blue light or red light, according to whether it was illuminated by means of an oscillatory or non-oscillatory discharge. By using the blue tube as the source and the red tube as the absorption tube, the two being arranged so as to be illuminated simultaneously, it might be found that the red tube had the power of absorbing to some extent the blue radiations from the other. I hardly think results would be obtained, but the experiment seems worth trying.

A picture taken by Mr. H. B. Lefroy, of Toronto, sent to me by Mr. Lumsden, secretary of the Astronomical and Physical Society of Toronto, has some very curious appearances. There is an exceedingly brilliant flash running down the center of the plate, illuminating the sky quite brilliantly in its neighborhood. In its immediate vicinity, though not joined to it in any way, are innumerable dark, threadlike markings, which in places seem to cross each other, forming meshes.

Mr. Lumsden assures me that the testimony of all photographic experts who have seen the plate is to the effect that markings of that description could only be produced in the exposure; that is, they are not due to faults in the film or the results of imperfect development. The fact that they are found only in the immediate vicinity of the bright flash is additional testimony in the same direction. These markings are wholly different from any that I have seen, not having the form of branched flashes. Something in their resemblance to photographs of sound-waves started by a spark, which I have recently made (see *Phil. Mag.* for August), suggested to me that they might possibly be due to the illumination of the sound wave due to a powerful discharge by a second discharge. Under ordinary conditions, that is, with a uniformly illuminated background, such waves would, of course, be invisible, but conditions might possibly arise, due to the proximity of black clouds, under which they might show—a sort of "Schlieren Methode" on a large scale. I have not attempted yet to plan an arrangement of clouds, which, by acting as screens to light coming from certain directions, might render visible a region of the air, in which the optical density underwent a rapid change. In Mr. Lumsden's picture there are many dark clouds close to the flash. The idea of a photograph of a thunder-wave is a pleasing fancy at all events.

It seems to me that it will be impossible to formulate even a reasonable guess as to the cause of these dark flashes until a good many pictures are gotten together for comparison, and as much testimony as possible secured as to the appearance of the flashes to the eye. Personally, I have seen very few of the pictures and never the original negative.

My intention in writing this letter is not so much to advance theories accounting for the phenomenon of the dark flash as to reawaken an interest in the subject and bring out ideas from persons better qualified than I to treat the matter.

Automobiles in Shanghai, China.

In reply to inquiries Consul-General Goodnow writes from Shanghai, July 10, 1899:

I would advise that catalogues and dealers' net prices be sent to the following American firms in Shanghai: American Trading Company, Mustard & Company, Dunning & Company, China & Japan Trading Company, Fearon, Daniel & Company, Wisner & Company, Frazar & Company and A. W. Danforth. It will probably be found feasible, after correspondence, to make one of these firms an exclusive agent.

This is an ideal place for motor vehicles. The town, built on alluvial deposit in the mouth of the Yangtze River, is level. The roads are macadamized, and the climate is such, especially in the Summer, that everybody drives. The horses are small, about the size and character of our Indian ponies. The foreigners are comparatively few (say 5,000 men, women and children); but there are nearly 500,000 Chinese in the settlements, and these take very kindly to our mechanical inventions as soon as they see them. Shanghai, also, is the distributing point for central and northern China. The merchants from the other treaty ports come here to buy their goods. Arrangements should be made to show vehicles, and to make a practical everyday demonstration of their ease of management and durability.

The Chinese will not buy goods without having seen them. The average Chinese has seen so few new things that it is not easy for him to exert his imagination. Foreigners here are also slow to buy motor vehicles. The prices are considered high, and many think of the vehicles as experimental playthings. Neither the foreigners nor the Chinese can be induced to buy by descriptions or catalogues. There have been one or two auto-motors shown here, but they were of an inferior type and manifestly unfit for either use or pleasure.

This is the best time to push this

trade in Shanghai, as there are no street railways here, and the city is growing so rapidly that need is felt for more rapid transit.

There are two ways to advertise these new vehicles. One is to send a machine to some person well known here, who will use it constantly, demonstrating the fact that it can be used by an amateur for pleasure at a cheap running cost. I am inclined to think myself that this would be the better plan. It must be remembered that the cost of transportation in Shanghai differs from that in Chicago. Here, a carriage with two horses, driver and footman can be hired for $75, Mexican (say, $36 gold), per month. Or if one owns ponies they can be fed for $6, Mexican, each per month, and the driver and footman can be hired for $17, Mexican (for the two), per month. It would be necessary, under this plan, to practically give the use of a vehicle to some well known person, who would use the same constantly and keep it in repair. It may be possible that a like result would be reached by placing the vehicles on exhibition with one of the above named firms, but if it is desired to get a part of the Chinese trade—which is immense and is thoroughly interested in American mechanical inventions—I would strongly urge that one or more machines be shown on the streets here, in such a manner that the Chinese will know that they are used by Americans of a position that will guarantee their desirability as vehicles of use, pleasure and fashion.

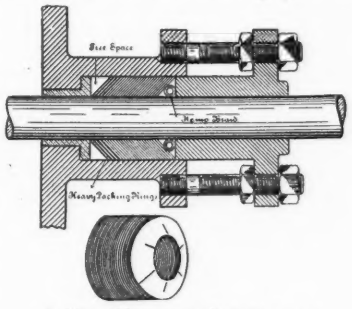
A New Metallic Stuffing-Box Packing.

The choice of a material for packing the stuffing-boxes of steam cylinders is not always easy, especially when superheated steam is used, as it so frequently is now-a-days. The illustration shows a new form of packing, especially intended for use with high-temperature steam, though available for all forms of gland work. It is stated by the manufacturers, the Galvanic Metal Paper Company, of 725 Broadway, New York, that it is self-lubricating and does not scratch the piston-rod, and that it is not affected by steam temperature as high as 350 degrees centigrade. It has been adopted by the German Government for use on its warships and railroads. The composition of the packing is rings of copper and nickel, made from "galvanic metal paper," and it is stated that it has withstood successfully many difficult tests to which it has been subjected.

Pennsylvania Street Railway Association's Convention.

The eighth annual meeting of the Pennsylvania Street Railway Association will be held at Lancaster on October 4 and 5, and promises to exceed in point of interest, instruction and entertainment any meeting heretofore held by the association.

The association will meet on Wednesday, at 11 A. M., at the Stevens House. Addresses will be delivered, and scientific papers on



A NEW METALLIC PACKING FOR STUFFING-BOXES.

different subjects of interest to the members of the association will be read and discussed, including addresses by Hon. James C. Beck, of Philadelphia; Frank Silliman, Jr., of the Scranton Railway Company; W. P. Mackenzie, of the Harrisburg Foundry and Machine Works, and others. The addresses to be delivered and papers prepared by practical street railway men will be a feature of unusual interest and instruction to the convention.

The second day will be devoted to a series of entertainments and excursions, including a trolley ride over the system of the Pennsylvania Traction Company, and luncheon at Chickie's Park. The indications point to a more largely attended meeting than any that has yet been held by the association. The list of papers to be presented at the meeting has not yet been completed, but programmes will shortly be mailed furnishing a detailed statement of exercises for the first day and the entertainments offered for the second day of the convention, both of which will be as instructive and enjoyable as any meeting that has yet been held by the association.

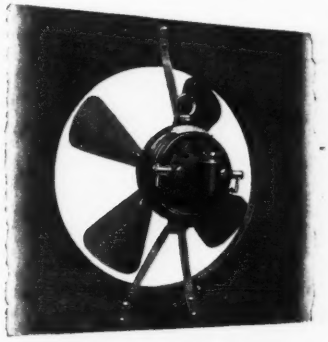
Members of the association are urged to send as many representatives as possible to the convention, and others who have not yet joined the association are also cordially invited to join and become acquainted with the advantages of membership in the association. For further information the secretary, Mr. S. P. Light, of Lebanon, Pa., should be addressed.

Switzerland's Electrical Exports.

During the year 1897 the value of the electrical machinery exported from Switzerland was no less than $1,650,000. The countries to which the machinery was sent are very numerous, but the following are the large purchasers in order of merit: France, Germany, Spain, Italy, Russia, Austria, while England came next on the list. The figures for 1898 are not yet to hand, but during the first quarter of this year the exports are valued at nearly $500,000. These figures are a great credit to the country, which has no special physical advantage for manufacturing, with the exception of water-power. It is also worthy of note that an Englishman (Mr. C. E. L. Brown) is at the head of one of the most prosperous electrical works of Switzerland.

Small Ventilating Fans.

The Sprague Electric Company, of New York city, makes a very convenient application of small fan motors to the work of ventilating. A Lundell fan motor, with the base removed, is mounted, by means of a tripod, on a board, in which a circular opening may be made of the same approximate diameter as the fan's blades, and the board may be cut to fit the top or bottom of a window. A small switch



A SMALL VENTILATING FAN.

is furnished, by which the speed can be suitably controlled, the switch, of course, being located wherever desirable. Special spoon-shaped blades are supplied with these outfits. The extreme simplicity of this apparatus recommends it for use in offices, churches, hospitals, residences, etc., where its installation will do much to mitigate the discomfort of vitiated air and at a very small expense.

Mr. John T. McRoy, 302 Broadway, New York, the well known manufacturer of vitrified clay conduits—a conduit that "will not rust or rot"—sends to each of his customers a calendar blotter monthly. The blotter also contains some epigrammatic statements, entitled "Short Circuits." The blotter is copyrighted by Mr. McRoy.

The Lighting of Tunnels.

The *Revue de l'Electricité* publishes a description of the way in which it is proposed to light the Batignolles Tunnel, near Paris. It seems that no less than five distinct railway lines pass through this tunnel on their way to the railway station at St. Lazaire. The number of trains using the line necessitates that at certain times the trains should be stopped in the tunnel, and the company therefore finds it necessary to provide artificial light in it. The first attempt was with arc lamps hung in the center of the arch, but it was found that this means was quite useless, as the smoke in the tunnel and the black walls prevented almost all the light from reaching the compartments of the train. After numerous other trials, the following system seems likely to be adopted:

A line of incandescent lamps of 10 candle-power will be placed a metre distance apart along the side of the tunnel. These lamps will be fixed at the height of the windows of the carriages, and will be automatically lighted and extinguished by the passage of the train. The number of pedals which will be depressed by the rims of the wheels work the switching gear. In this way, any train stopping in the tunnel will be lighted fairly well from the outside, and much less electrical energy will be used than if the tunnel was continually lighted. The first installation will consist of 150 lamps only, but if the system is deemed successful by the traveling public and the authorities of the line, the full length of the tunnel will be lighted.

Variation of Magnetic Declination.

G. Hellmann points out in *Terrestrial Magnetism* that after Columbus discovered the variation of the magnetic declination in 1492, the belief gained ground among mariners that the longitude could be immediately determined from the variation; but Mr. Hellmann points out that the variation remained unknown, outside nautical circles, until it was independently discovered in connection with the use of the compass for portable sun dials. It was Georg Hartmann, a mathematical instrument maker at Nuremberg, who discovered the magnetic variation on land and found it to be only six degrees east at Rome in 1510. For nearly 100 years after this discovery, most of the writers on magnetism and dials omitted all mention of the declination and assumed that the needle pointed true to the polar star. By sighting along the needle to the polar star, the variation was measured.

The Industrial Deadlock in Great Britain.

[From the London *Electrical Review.*]

Attention has been drawn recently in these columns to the difficulties that beset the electrical industry in being unable to cope with the constant stream of orders that is flowing in. There are some philosophers who maintain that to have a plethora of orders is almost as bad as having none. Probably there is a certain amount of truth in the assertion, but there is this marked difference, when a man has no orders he may be credited with doing his best, but when his shops are so full that he can not keep up to time he receives the obloquy of all. It must be admitted that the manufacturers of electrical apparatus have met with most generous consideration at the hands of both consulting engineers and municipalities. Probably this indulgence arises to some extent from the difficulty in enforcing penalties, but whatever there may be in this there has been no disposition to harass manufacturers in spite of their delinquencies.

If orders remain unexecuted a few weeks beyond the specified period it may be highly inconvenient, but when weeks pass into months and occasionally into years before electrical plant is delivered, the matter goes beyond the bounds of reason. Yet, it is well known that makers of electrical machinery, in one or two cases, have been over 18 months behind hand with their machines. These are probably the worst instances, but they show in the clearest possible manner either that some shops are overrating their capacity, or that there is some strikingly bad management. In the comparatively early days of the electrical industry, when manufacturing concerns rarely or never paid dividends, it was urged, possibly with some reason, that extravagant prices of patents, with the resultant over-capitalization, were responsible for the inability to make profits. But nowadays all that is changed. The electrical industry is practically free from patents that touch the main features of electrical supply, and the chief effects of over-capitalization have been swept away. How is it, then, with the prospect of fair profits, with the accumulated experience of years and the employment of the most highly skilled labor, that so many English manufacturers are unable to keep their promises? To some extent the matter is capable of explanation. Up to a certain point the demand for electrical machinery was a gradually increasing one, and manufacturers were able to complete contracts somewhere near the specified time. So far as we are aware, however, there appeared to be little disposition on the part of the managers of workshops to look a little ahead and make some provision for the boom in electrical plant that was bound to come; so long as the work in hand was completed the morrow might take care of itself. We are not for a moment suggesting that every manufacturer in the country was imbued with this policy of *laissez faire,* but we do not exaggerate when we say that the great majority have acted on this principle. What is the result? The boom in electrical enterprise has come and filled the English shops to overflowing, and the orders have followed so rapidly on one another that the energy of a portion of the staff has been devoted to carrying out extensions of the workshops. Orders for plant have been taken with a sort of blind faith that everything will come right in the end, and probably it will, but in the meantime there is a reckoning to be paid. It is never pleasant to turn work away from one's doors, but, assuming one has a clear knowledge of the possible output of a shop, it seems the height of folly to endeavor to double it. A harsh term would be applied to a person who sought to put more than a pint into a pint pot; yet that is precisely what the home manufacturer has been attempting. There may have been an idea that when the large towns had put down electrical machinery there would be very little more required, but the systems at present in existence have done little more than merely demonstrate the commercial possibilities of electric lighting and power supply. Before electricity is supplied to the average householder, enormous plants will need to be erected.

Just when electric lighting had become established on a sound commercial basis, municipalities and tramway authorities became convinced of the economy of electricity when applied to tramways. But the demand for tramway plant and materials that followed has found our English works totally unprepared to meet it. Our American friends very readily perceived our state of unpreparedness, and they have quickly filled the breach. The consequence is that some of the very best orders for electrical machinery are to-day crossing the Atlantic. We are quite aware that the strength of the Americans in this country may be exaggerated. If the newspaper reports are to be relied on, the chairman of the Midland Railway Company has declared that the engines which have been recently supplied by the Americans were not nearly so good as those constructed at home. There are authorities in this country who maintain that many of the engines supplied from America for tramway work are inferior to those of English manufacture, but, whatever truth there may be in that opinion, it is obvious that if American engines can be relied upon to perform fairly satisfactorily, they will, by reason of quick delivery, continue to be used to a considerable extent.

Although we have pointed out the delay that has arisen in the delivery of a good deal of electrical plant, we readily enough admit that the majority of firms will not at the present moment accept orders for machinery under a somewhat protracted period. That must necessarily divert orders either to America or to the Continent. But regrettable though that may be from a merely insular point of view, it is, from the standpoint of the electrical industry, infinitely to be preferred to keeping customers waiting for long periods.

Here and there workshops spring up, and, for a time at least, their chief advertisement is "early delivery," and apparently on the strength of that alone they secure a large number of orders; but their shops are soon overstocked with work, and very speedily they join the ranks of the great majority who are too busy to promise delivery under six or nine months. The cry of too much work is an irritating one, and it is doubtful if the manufacturers are doing any good to themselves by constantly repeating it. It may rise to the reflection among men that either English works are limited in their capacity or they lack organization. In some industries it is astonishing how the supply keeps pace with the demand; we take it that neither Whiteley's nor Lipton's would ever have succeeded if they had become too busy. A growing demand needs courage and a long head in order that it may be properly met.

It is almost unnecessary at the moment to enlarge upon the superior position of the American firms to English houses in their ability to deliver plant quickly. At different times we have endeavored to analyze the causes that account for these marked differences between the American and English electrical industry, but whatever may be the true reasons, the effects are occasionally brought before us in the most forcible manner. The demand for electric motors must be already a very large one, but when electric driving becomes properly recognized, both in large and small factories, an enormous number of motors will be required. With the present limited use, however, English manufacturers can not supply them under some months. Quite recently a well known engineer endeavored to obtain a considerable number of electric motors for a client, but it was impossible to secure them within a reasonable period in this country; yet within three weeks an American firm was able to deliver the complete set of 40 of varying horse-powers. English manufacturers would have designed and made them specially; the American firm took them from stock.

An Automobile Parade at Newport.

The Summer colony at Newport, R. I., enjoyed, on September 7, an automobile parade, the first of its kind at that place. It was arranged by Mrs. O. H. P. Belmont, Mrs. Herman Oelrichs and Mrs. Stuyvesant Fish. There were nineteen automobiles in line, handsomely decorated with ribbons and flowers. The meet occurred at 4.30 o'clock in the afternoon at the villa of Mr. Belmont. The carriages were put through various manœuvres, including tests of skill in running as close as possible, without striking, to dummy horses and wagons and human figures. Mrs. Oelrichs's vehicle came to grief through the breaking of the rear axle. Mrs. Belmont's electromobile was the most elaborately decorated of any. It was trimmed with hydrangeas and royal purple ribbons and surmounted with a canopy studded with miniature electric lights. In front of the vehicle was a pair of shafts to which was harnessed a large butterfly made of gauze. Prizes were awarded for evolutions and for decorations. The parade was followed by a dinner at Gray Crag, served on a table laid out as a floral garden, with a pond as a center piece. This was followed by dancing. It was probably the most unique entertainment ever given at Newport, and was a thorough success.

Mr. John Hogan, of New York, owns a valuable mare named Lady Jane, a high-stepper and of some celebrity on local tracks, but seemingly unable to appreciate the deliverance of her kind from bondage by the agency of the electromobile. One evening last week her owner stopped the mare in East Forty-second street and hired a small boy to stand at her head while he went indoors. An electromobile delivery wagon came along presently and Lady Jane stood on her hind legs and pawed the air. The boy stood this about 10 seconds. Then he loosed his hold and the mare headed down the street, dodging the electromobile which had backed up under her nose. She crossed Second avenue, went through the tunnel between Second and First avenues and crossed First avenue, banged the carriage against an electric light pole and turning on to the river front, gave a leap that landed her in the river 25 feet from shore. For over eight hours the mare floated about before she could be rescued, but she was finally hauled out of the water, somewhat subdued but seemingly none the worse for her experiences.

Does Electricity Kill?

The question of whether death is the actual result of powerful electric shock, or whether it follows as an effect of physiological conditions superinduced by shock, has never been settled with authority. Many physicians have believed that persons apparently dead from electric shock, such as the criminals executed by electricity in the state of New York, could be resuscitated if prompt and proper measures were employed.

Dr. Richard H. Cunningham, of Columbia University, has been experimenting upon this matter, and has lately stated that it has been demonstrated beyond contradiction that an animal apparently killed by an electric current, and in whose body respiration and circulation have ceased, may be brought to life.

It is also asserted by Dr. Cunningham that an ordinary industrial electric current, such as is used in performing legal executions in New York state, does not produce instant death, and that if it were possible to have in constant readiness suitable apparatus, the suspended vital functions and consciousness could be restored.

Experiments which he has made are said to establish the fact that in cases where death follows an electric shock, it is not caused by paralysis of the heart or by any of the other causes to which death has heretofore been attributed, but to fibrilar contraction of the heart, which results in collapse of the nervous system. In all cases of this kind, it is claimed, death is preceded by a period of consciousness, during which the recipient of the shock feels, but at the same time it is improbable that there is an accompanying sensation of pain.

Dr. Cunningham says that it is only in the case of an electric shock wherein the current is so strong that all the tissues are cooked, and the nervous system thus destroyed, that death is instantaneous.

In describing the experiments which he has made with dogs, frogs, turtles, etc., as subjects, Dr. Cunningham says:

"If the thorax of an animal be opened immediately after a strong electric current has passed through the heart *via* the skin, and the heart be exposed, it will be seen that, although the co-ordinated beat of the heart as a whole is absent, the little bundles of muscle fibres still contract and relax with considerable vigor, but as the right cavities of the heart become more and more distended the action of the muscles ceases.

"The quivering is the state known as fibrilar contraction. In this condition the heart can be restored to its functions by the perfusion of its blood vessels with warmed defibrinated dog's blood, diluted with an eight per cent saline solution. By means of it I have repeatedly caused the fibrilating hearts, after having been taken from the body of dogs apparently killed by electricity, to beat co-ordinately for an hour. This clearly disproves the fact that muscular substance has been paralyzed or killed by the current.

"I have endeavored repeatedly to electrocute frogs and a small turtle with the 115-volt continuous dynamo current, but none could be killed, and all the frogs fully recovered within a few minutes. According to the consensus of opinion, writers on the subject of death by electric shock agree that such a death is instantaneous.

"From my tracings recording the muscular and nervous contractions, from the experiences of three of my patients who have received severe shocks, and from the published accounts of 16 cases of recovery after electrical shocks, there seems to be ample time before loss of consciousness occurs for the recipient of the shock to become fully aware that he is, or has been, in contact with an electric current. Thus, every one of the 19 mentioned felt some very distinct form of sensation before consciousness was lost. Generally speaking, the sensation was not exactly painful, and was described by them as similar in character to the sensation produced by catching hold of the electrodes of a small but strong medical induction coil.

"After an apparently fatal shock has been received from a current the proper measures are to restore quickly the circulation not only of the nervous system, to keep it from dying, but also of the heart, so that it may quickly recover its co-ordinate contractions.

"As far as I know there is but one way in which this may possibly be accomplished—namely, by creating artificially a temporary circulation of a fluid capable of sustaining the heart and the nervous system until the heart has recovered sufficiently to maintain the circulation in the normal manner."

Captain Robert McCulloch, ex-president of the American Street Railway Association, and a prominent street railway man of St. Louis, has been appointed general manager of the Chicago City Railway Company.

The American Electrical Works' Clambake.

The twenty-first annual clambake tendered to the electrical fraternity by Mr. Eugene F. Phillips, general manager of the American Electrical Works, Providence, R. I., occurred on Saturday, September 9, at the Pomham Club, near Providence. It was the most successful and one of the most largely attended of any of the long series of entertainments which Mr. Phillips has so generously provided. There were about four hundred guests present, the majority of them from New England, although many came from considerable distances. The party met at the Narragansett Hotel, in Providence, and made the journey to the Pomham Club in special trolley cars chartered for the occasion. Luncheon was

SOUVENIR OF THE AMERICAN ELECTRICAL WORKS' TWENTY-FIRST ANNUAL CLAMBAKE

served at eleven o'clock, after which athletic sports, including a base ball game, were indulged in. Then a group photograph of the guests was made, the assembled multitude posing on a hillside for the purpose.

The clambake was served promptly at two o'clock, and was of that excellent quality which has made the Pomham Club famous. The menu was an elaborate one, and was handsomely printed on sheets of frosted copper. At the conclusion of the meal Mr. Phillips delivered a neat address of welcome, in which he assumed that his guests were members of one family who had come home to celebrate its twenty-first birthday. He referred to the importance of the work electricians were doing for the world at large, and asserted that the human race could get along better without congressmen than without electricians. He urged his friends to come again next year and renew their boyhood under the same circumstances.

Major R. S. Brown, of the Westinghouse Electric and Manufacturing Company, who acted as toastmaster, after making appropriate remarks in a witty vein, introduced Congressman A. B. Capron, who interspersed a few serious remarks with others strictly appropriate to the occasion. In the course of his talk, Congressman Capron said:

"We are now facing the most crucial hours in our nation's history, and none of us has a right to be idle, for there is much to be done. I do not care whether you are a Democrat or a Republican, so long as you are something. Of all men, I have always hated a traitor, and I hate him just as much whether he is Aguinaldo, of the Philippines, or Edward Atkinson, of Boston. It is our first duty to stand by and support our Government."

The tremendous applause which greeted these patriotic remarks showed that even in the heart of the anti-expansionists' lair, real Americans were in the majority.

Other speakers were Messrs. J. B. Wendell, of Wendell & McDuffie, of New York; F. A. Gilbert, president of the Boston Electric Light Company; C. B. Fairchild, of the *Street Railway Review*, and Frank Ridlon, of Boston.

Among the prominent guests were Messrs. C. A. White, general manager of the Providence Telephone Company; A. J. De Camp, the well known electric light man of Philadelphia, and Mr. C. O. Baker, Jr., the platinum magnate of New York city. Mr. Baker's acceptance of Mr. Phillips's invitation was engraved on a sheet of platinum, designed to show the generous host, whose invitations were on sheets of copper, that there were other metallic magnates besides himself. It was suggested during the clambake that none but electricians could afford to juggle so carelessly with metals even more precious than gold in the present state of the market, and some one said that if proper connections were made between Mr. Phillips and Mr. Baker, the copper invitation, the platinum acceptance and a bottle of sarsaparilla, the problem of generating electricity without coal would be at once solved.

In the illustration herewith is shown the handsome souvenir with which Mr. Phillips provided his guests. The miniature loving-cup was designed to be symbolical of the good fellowship prevailing on the occasion.

The twenty-first annual clambake of the American Electrical Works will be remembered with pleasure for many years to come by all those who were fortunate enough to be present.

Electric Mine Haulage.

Electricity is the coming power for every line of mining work. We find electrical apparatus employed for hoisting, pumping, drilling and all the operations of mining. Already many mining proprietors have made a substantial increase to their financial returns by the introduction of electrical apparatus. In Ohio and Pennsylvania several large coal mining companies are using electric coal-cutters in place of hand labor. Underground electric haulage is another wide field which is being rapidly exploited. This system has a valuable application, as it supplants the clumsy chains, wire ropes and mule haulage, and lessens the chances of accidents. As coal mines extend over a considerable space the question of haulage is one of moment, and makes the consideration of economy in traction of great interest to colliery owners.

BALDWIN-WESTINGHOUSE ELECTRIC MINE LOCOMOTIVE.

The illustration herewith shows a Baldwin-Westinghouse electric mine locomotive supplied to the Berwind-White Coal Mining Company, Windber, Pa. The locomotive was built at the Baldwin Locomotive Works, Philadelphia, and is furnished with two Westinghouse single-reduction motors, one geared to each axle, and each capable of developing 2,150 pounds pull at the draw-bar at full load on level track. The driving wheels are 30 inches in diameter, and the axles are spaced four feet apart between centers. The total weight is 26,000 pounds, all of which is carried by the drivers. The journals are unusually large, being four inches and six inches in diameter, carefully protected against dust. The extreme height of the locomotive, exclusive of trolley, is 38 inches, the width 59 inches, and the length, exclusive of bumpers, 12 feet. The draw-bar pull is 4,300 pounds at eight miles per hour on the level, but in practice this has been exceeded. Electric current is taken through the trolley wheel, shown in the illustration, from the conducting wire overhead.

The locomotive illustrated is known as the double end type, having an operator's platform at each end, with a duplicate of all operating levers. Great care has been taken in the design that all switches and levers may be within reach of the seated motorman, and convenient for quick control of the locomotive. Two 50-horse-power motors are separately spring supported, one geared to each axle by single reduction gearing, running in oil lubrication in tight cases. The motors have been designed specially for mine service, having four poles, being of the steel-clad enclosed railway type. The armatures are of the iron-clad type, the coils being held in slots below the surface, and secured from displacement as in the most approved railway practice.

The current controller, or starting device, at each end of the locomotive, is of the latest rheostatic type, with magnetic blowout to prevent arcing at the contacts. It is provided with various speed changes, and is operated by handles for starting and reversing. The rheostat of the diverter is of a non-combustible type, very compactly set up, and has a large carrying capacity. Special attention has been given to the capacity of this rheostat to avoid overheating, as the working capacity of electric mine locomotives is often seriously impaired by failure to provide sufficient resistance to take care of the varying operations of switching and light-load running. The brake apparatus, which is fitted to all wheels, is of simple design and of sufficient power to utilize the track adhesion due to the weight of the locomotive. The journal boxes are of ample dimensions, and have bronze bearings, with oil cellars for sponging, as in steam locomotive practice.

One of the special features of these locomotives consists of the separate spring supports, the entire machine, with electrical apparatus, being supported on the journal boxes by helical springs, which prevent destructive pounding on the track, and relieve the machinery from shock. The frame consists of heavy cast-iron side and end-pieces securely bolted together.

Electric mine locomotives are built in a very compact form to adapt them to mine galleries. Where several mines are contiguous, it is customary to install a central power-house, conducting electric current by wires to the surrounding mines. The current can be used, not only for traction purposes, but for lighting the mines, and for operating coal-cutters, pumps and drills.

As regards the economy of using electric haulage in mines, careful comparisons have been made by experts. It is usually estimated that haulage by mules costs 50 cents a day for each mule. Figures have been secured from several mines, from which the output varied from 250 to 700 tons a day, and where the length of track varied considerably. The average result showed that the daily expenses of operating with electric mine locomotives were 40 per cent of the cost of mule-power, depending to some extent upon the output of the mine and the distance hauled. Interest on the capital invested in electric apparatus must be added to the daily operating expenses. Taking this into consideration it has been found that the average saving affected by the electric system compared with mule haulage represents 25 per cent to 30 per cent per annum upon the capital invested.

The combined experience of the Baldwin Locomotive Works, and that of the Westinghouse Electric and Manufacturing Company, have produced a type of electric mine locomotive in every way thoroughly adapted to the arduous work met with in underground haulage. The range of practical requirements has been thoroughly considered, and provision made to meet every possible exigency.

Shelbyville, Ind., rejoices in the possession of a new telephone exchange plant, as a result of live power wires coming in contact with the exchange wires and the consequent total destruction of the old plant, on the night of August 6. The Shelbyville people within two days after the accident placed an order with the Sterling Electric Company, of Chicago, for a new equipment of a 500-number switchboard, together with a distributing board and a complete outfit of office terminals and protective apparatus. This order the latter company accepted and installed in a little over three weeks, an undertaking the satisfactory fulfillment of which, considering the congested state of the telephone market, was certainly a very creditable performance.

THE ADVISABILITY OF CONCENTRATING THE CONTROL OF ALL MUNICIPAL ELECTRICAL INTERESTS UNDER ONE HEAD.

READ BEFORE THE NATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS, WILMINGTON, DEL., SEPTEMBER 6, 1899, BY MORRIS W. MEAD.

(Concluded from page 154.)

Even the smallest of our cities are putting on the municipal airs of the largest, and to keep up with the times, especially in electrical work, is of the highest importance—a work which 95 per cent of the people are thoroughly ignorant of.

The one who stands between this vast ignorance of these things on the part of the people, and the municipalities, are the municipal electricians.

They must in the future, more than ever, represent the safety valve of electrical protection. It has been too much the case that a superintendent of fire alarm, or superintendent of police telegraph, would each sit supinely by and let electric light matters and the march of improvement, in inspection matters, hurry past him in their course. While he, in the same old way, runs his one branch without reference to the rest.

He soon finds himself surrounded with hills of electrical development, and waking up suddenly finds it too late to catch up with the train of progress.

Thus, towns, cities and municipalities are retarded in their electrical growth by this self-satisfied, partial knowledge of things.

A man blunts his own powers of comprehension; he ignorantly or carelessly interferes with the growth of what might have been a great, a trained intellect, in a broader field.

He is a grand example of a good man spoiled, and spoiled by his own supineness.

The electrical industries are full of the brightest minds, the towns and cities, those vast forces of aggregated ideas have many of these bright brains at work for their best interest and protection, but there are many who are in charge of this new scientific engine—electricity—who do not fully realize their responsibility to the public, who should be studying in other branches of this science, except the limited one of a fire or police telegraph supervision.

They should bring out their latent power and capacity, if they have any; if not, for the sake of their town's or city's best interest, should step aside and let another protect the citizenship of their localities in these matters.

Hence, the complete proposition: any man in charge of electrical work who is qualified to administer one branch of it should be fit to administer all the applied branches of it.

The concentration of the control of all municipal electrical interests under one head, I think is advisable and bound to come, and, by preparing one's self as above indicated, will make you, each and all, competent; and if some of you don't happen to be appointed the main executive and scientific manager, if the lightning does not happen to strike your way, you will, at least, make better assistants than you otherwise would, and likely to be employed as such, and thus be ready for advancement at the proper time.

The more any man knows about a particular thing, the better he will be qualified to execute any portion of a similar trust reposed in him.

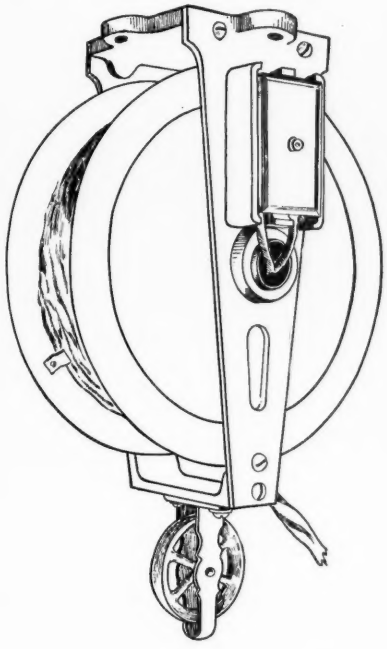
Thus you will now see the applicability of all the previous arguments, when you may have thought that at times I was slightly digressing.

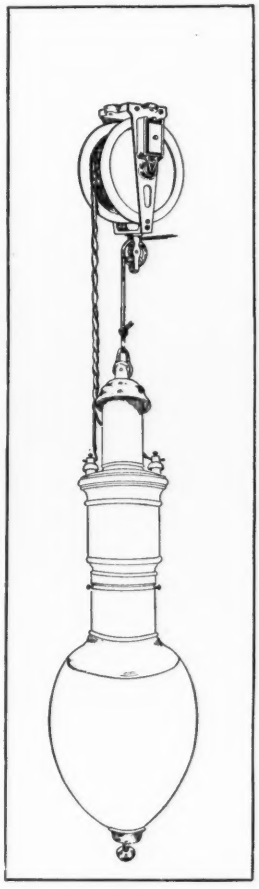
Our work is technical and scientific, but it is somewhat like the art of printing—while an outsider can not do it at all, one of us can do it, or at least thinks he can, about as well as another.

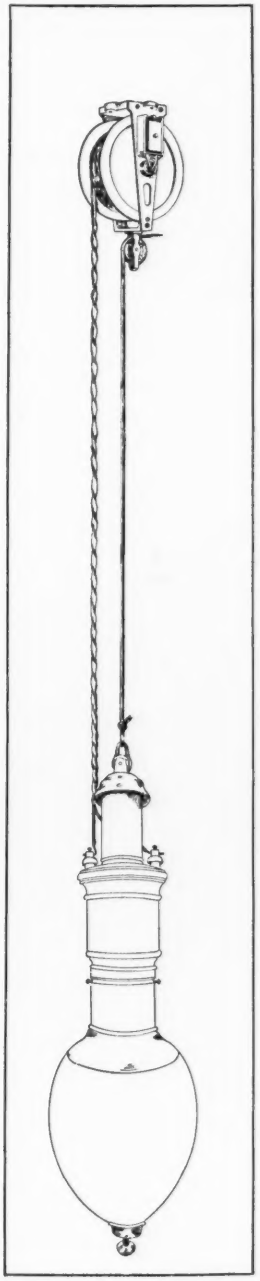
Yet the system, or rather lack of system, in most cities is very much as though the editor and owner of any of our leading electrical papers should turn loose each of his printers to set into type whatever seemed good to each of them, and give each of his contributors a blind and unlimited license to write whatever he thought was wise and interesting. I fancy that if he conducted his magazine on that system for about six months he would not have every member of this body among his subscribers.

I simply make the plea for the same system in municipal electrical matters that has been found to be most efficient in every other form of business, even in politics and religion.

In politics the conditions have developed the "boss," in religion we have controlling individualities, and in all forms of business, electrical, municipal and otherwise, we must have the one-man power, without which there is no means of fixing responsibility on any man, and no possibility of getting the most prompt and trustworthy service in an emergency.







FIGS. 1, 2 AND 3.—THE "G-I" ARC LAMP HANGER REEL.

The "G-I" Arc Lamp Hanger Reel.

This appliance, which is illustrated herewith, is claimed to be the most satisfactory device of the kind on the market, covering all the requirements for a self-winding electric reel to feed an arc lamp or similar electric fixture which it is desired to raise and lower, for use and for trimming, as in the case where the employment of long step-ladders is objectionable.

It is of very simple and substantial construction, the drum being of iron, the insulating parts of slate and the current carrying parts, of course, of copper. It can be used indoors or out, and is fire and waterproof.

The illustrations show the device in both positions (when raised and when let down) and hardly require further explanation. The device consists of a cast-iron drum supported with iron brackets, as shown, which can be fastened to a ceiling, a wall, a pole, or any similar support. Inside of the drum is a strong tempered coil spring, of the proper power, to take up the flexible conductor carrying the current, which winds or unwinds on the outside of the drum. On the supporting brackets are mounted the porcelain cutouts required by the underwriters' rules. This device is manufactured by the General Incandescent Arc Light Company, of New York city, to comply with these rules in all respects.

THE LICENSING OF EMPLOYÉS ON ELECTRICAL WORK, AND IMPROVING THE QUALITY OF WORK AND MATERIAL.*

BY CAPT. WILLIAM BROPHY.

Your committee in selecting this topic acted wisely, for there is no subject that is of greater importance to those engaged in all branches of electrical industries, municipal electricians, fire underwriters and the people at large. Whether they proved their wisdom in assigning it to me for treatment or not remains for you gentlemen who are within the sound of my voice, and that much larger audience who listen to me and others through the medium of that powerful institution, the press, to decide. It brings an audience spread over the entire length and breadth of this great and glorious country of ours, whether sitting at their firesides, in the office, factory or workshop, practically within the hearing of any speaker, no matter where he may be. For that reason it behooves each one who accepts the task of addressing you on the topics selected to put forth their best efforts,in order to strengthen this association and show that its mission is an important one to ourselves, our fellow workers, public officials and, best of all, the people at large. I trust that I shall be able to claim the attention of a portion of those here mentioned, and arouse them from their present state of indifference to the subject I am about to discuss.

I will first take up the question of licensing employés.

The municipal supervision of electrical wires, fixtures and appliances, the insurance inspector and adjuster, the reputable contractor, the architect and those who have suffered at the hands of the would-be electricians (?) need not be told that electrical workers, both employés and employers, should be compelled to prove their ability to deal with this subtle force, whether they are engaged in installing intricate paths for its distribution, operating generators that set it in motion, or caring for the delicate instruments that control its action, before being permitted to enter the ranks of electrical workers.

Electricity has such a wide application that the men who are perfectly familiar with all its branches are somewhat rare, and for that reason electrical workers must be to a great extent specialists; in other words, they must become experts in some one or two branches of electrical business. For this reason I shall be obliged to discuss the qualifications necessary for men occupying positions in some of the most important branches of the electrical business.

No doubt the greatest need for skill and expert knowledge exists in the electric light and power branch of the electrical business; not that it is more important than the telephone and telegraph service, the fire and police signal service, or the street railway service, but because the dangers resulting from improperly installed electric light wires and appliances are not fully appreciated by city and town authorities, and the great thinking and unthinking public. While I contend now, as I have always done in the past, that electric lights, properly installed, are the safest form of artificial illumination, yet, when installed by incompetent or dishonest persons, the same become a menace to both life and property.

In the city of Boston, alone, 66,774 horse-power is converted into electrical energy; 34,500 of this is used for the propulsion of street cars; leaving 32,274 horse-power to be converted into light and power through the medium of electric motors. All this vast amount of power passes over and under the surface of the streets, and through the stores, warehouses, theatres and other places of amusement, churches and dwellings. This energy is converted into three systems of electric lighting—direct arc incandescent and the transformer system. The difference of potential at the brushes of the arc dynamos is from 4,350 to 8,415 volts; with 10 miles of wire in each circuit these figures would be 4,371 and 8,436 volts difference of potential at the brushes of the dynamo. In one case there would be 58 lamps in series, while in the other there would be 115.

It is hardly necessary for me to state that the greatest care should be exercised in installing the wires, lamps, switches and other appliances which go to make up one of these circuits. With the present type of insulating covering for overhead wires it can not be said that any of the overhead portion of the circuit is insulated during stormy weather, and very little of it at any other time. Were it possible to maintain the absolute insulation of these circuits at from 50 to 300 megohms per mile there would be but little danger attending the transmission of electrical energy, but unfortunately the insulation of overhead circuits can not be maintained at even one megohm, and there are times when many of them do not maintain an insulation resistance of 500 ohms per mile. For this reason it is absolutely necessary that the insulation of all portions of these circuits that are contained in buildings of any kind should be maintained at the highest possible point; the insulating covering of wires should be handled with the greatest care and not injured through carelessness or ignorance; the translating devices should be of the best, and of a type adapted to this particular kind of service, and wires, lamps, switches, etc., should be placed beyond the reach of all persons, whether owners, occupants, employés, or others, except those who have the care and supervision of the same. All this is necessary in order to keep this silent, subtle and mysterious force within the limits of the path over which it should traverse, for when once it leaves its prescribed course the damage it may cause to property can not always be estimated, and worse still, loss of life may result when it traverses the human body.

Next comes the transformer, or, as it is sometimes called, the alternating system of incandescent lighting. This was devised to render it possible to transmit electrical energy over long distances by means of high potential currents, the direction of the flow of which is changed at frequent intervals. The difference of potential in the primary circuit is 2,000 volts, as this is too high for incandescent lamps, and if it were not, it would be extremely dangerous to bring it within reach of persons through the medium of such lamps as at present used; the current in these primary circuits is utilized to induce a secondary current in secondary circuits, in which is maintained a difference of potential of 100 to 104 volts, which is sufficient to bring the lamps to a state of incandescence and a proper amount of candle-power. This end is attained by means of induction coils, the technical name of which is transformer. The greatest care is taken to insulate the primary and secondary coils one from the other, in order to prevent the high-tension current from entering the secondary or house circuit; but the insulation on dynamos and transformers can be destroyed if either are overloaded or taxed beyond their capacity, which may be done in several ways; namely, by attempting to supply too many lamps; by an accidental short circuit between the secondary mains; and last, but not least, by defective insulation of the wires and fixtures within the buildings; this has in the past, and will in the future, cause the failure of transformers, resulting in fires and possible loss of life.

The amount of current flowing through any circuit is in proportion to the resistance, and the resistance of any circuit, where the lamps are in multiple arc, is decreased as the number of lamps is increased, and nearly all incandescent lamps are in parallel or multiple arc; by placing too many lamps in a circuit the resistance is reduced and the flow of current increased, possibly to such an extent as to overheat the wires and destroy the insulation of the transformer; an accidental short-circuiting of the secondary mains will bring about the same result, but in that case the safety fuses are apt to melt before the insulation is injured, unless through ignorance or carelessness copper wire is substituted for fusible metal, or the carrying capacity of the latter is greatly in excess of the circuit it is designed to protect. The greatest source of danger, however, is from poorly insulated wire and fixtures, from which current escapes slowly at first, increasing gradually until its volume is sufficient to cause a fire at the point of escape, or in the transformer when fires are sure to break out at nearly every lamp and fixture; if this does not occur, there is danger to every person handling lamps, switches, etc., particularly when standing on moist ground, or when in contact with steam radiators, gas, water or drain pipes, and any other conducting substences connected to the ground.

The direct low-tension system of incandescent lighting has nothing intervening between the dynamos, lamps, motors and other appliances in the shape of transforming devices; the current from the generator going to the lamps, motors, etc., at practically the same pressure at which it leaves the same. Central stations furnishing lights under this plan use the three-wire system, which was the first attempt at reducing the cost of copper conductors and extending the area over which light could be supplied. The difference of potential at the generating station and at the center of distribution, between the two outside wires, is 220 volts, but the difference between the middle or neutral and the two outside wires does not exceed 110 volts. Injurious shocks can not be received by persons from the wires of this system, as the difference of potential between lamp terminals is constant and does not vary with the number of lamps, motors, etc., in the circuit, but the amount of current is not constant but varies with the load. While imperfectly insulated wires, fixtures and appliances in this system will not cause injury to persons who handle or come in contact with them, yet the danger of fire resulting therefrom is as great as from any other system of electric lighting.

With eight or nine hundred horse-power converted into electrical energy and delivering the same into one system of feeders, mains and circuits, and when we consider that electrical energy can be, and is converted into heat, the possible consequences resulting from carelessness, incompetency, or dishonesty in those engaged in electrical construction is a serious matter, and a fruitful subject for thoughtful men to consider.

The construction of constant-potential circuits requires the greatest possible care; in order to secure a uniform candle-power the drop in the wires must be determined accurately and must be uniform throughout the entire system; the safety fuses (which are the safety valves) must be properly proportioned to the safe carrying

* A paper read before the National Association of Municipal Electricians, Wilmington, Del., September 6, 1899.

capacity of the conductors; the wires must be highly insulated from each other and the ground; switches must be of ample carrying capacity, mechanically strong and durable; the insulating covering on wires must be of the best quality, particularly when conductors are placed in conduit or in the stems of chandeliers or side brackets; when supported on porcelain insulators and cleats and in tubes of the same material and opposite poles well separated, no trouble will result from such wires even when the covering thereon ceases to be an insulator.

Power circuits designed to supply energy to electric motors exclusively require the same care in construction, and the same quality of material and appliances as those already described.

The difference in potential, 500 to 550 volts, does not endanger the life of human beings who are in the enjoyment of good health, but the danger of fire, due to improper construction and other causes, is as great as in the systems already described.

Street railway systems, owing to the fact that they enter no buildings but the power-houses and car stables, will not receive much attention at my hands at this time. One-half of these circuits (with few exceptions) are over our heads, while the other (the rails) are on the surface of the streets. Owing to the latter fact, cheap construction has menaced the water and gas systems of many towns and cities, and caused almost irreparable injury to many of them, which may not be discovered in many cases until fires occur and lives are lost through the medium of leaky gas mains, weakened by electrolytic action.

(To be continued.)

Wireless Telegraphy During the British Naval Manœuvres.

We have already referred briefly to the trials of Mr. Marconi's wireless telegraph apparatus at the naval manœuvres, and we have now received a letter from Mr. Marconi himself, giving us some interesting additional information, and directing our attention to the significance of the experiments from a theoretical point of view, says the (London) *Electrician*. The maximum distance to which service messages were sent was 60 sea miles, and this was obtained with apparatus similar to that which has been in use for some time past at South Foreland, the vertical wires being 150 feet and 128 feet long. Mr. Marconi points out that it would geometrically be necessary to have poles 700 feet high at each end, in order that a line between their summits should clear the curved surface of the earth. The greatest height employed above the level of the sea, however, did not exceed 170 feet, so that the Hertz waves, if it were really Hertz waves that passed, had either to go over a dome of water 530 feet higher than the top of the masts, or to pass through it. This thickness of water, Mr. Marconi considers, would probably be much more opaque than Dover cliff. Non-official messages were obtained up to 74 sea miles in one stretch, which Mr. Marconi considers to be an undoubted record for electric waves.

The following detailed particulars of the trials are given in an article by Commander E. P. Statham, R. N., in the *Navy and Army Illustrated:* When the Reserve Fleet first assembled at Torbay, the "Juno" was sent out day by day to communicate at various distances with the flagship; and the range was speedily increased to over 30 miles, ultimately reaching something like 50 miles. At Milford Haven the "Europa" was fitted out, the first step being the securing to the main topmast head of a hastily prepared spar, carrying a small gaff or sprit, to which was attached the receiver, the wire from it being brought down to the starboard side of the quarter-deck through an insulator, and into a roomy deck-house on the lower after-bridge which contained the various instruments.

When hostilities commenced, the "Europa" was the leading ship of a squadron of seven cruisers despatched to look for the convoy at the rendezvous. The "Juno" was detached to act as a link when necessary, and to scout for the enemy, and the flagship, of course, remained with the slower battle squadron. The "Europa" was in direct communication with the flagship long after leaving Milford Haven, the gap between reaching 30 or 40 miles before she lost touch, steaming ahead at a fast speed.

Reaching the convoy at four o'clock one afternoon, and leaving it and the other cruisers in charge of the senior captain, the "Europa" hastened back towards another rendezvous, where the admiral had intended remaining until he should hear whether the enemy had found and captured the convoy. But scarcely had she got well ahead of the slow ships when the "Juno" called her up, and announced the admiral coming on to meet the convoy. The "Juno" was at this time fully 60 miles distant from the "Europa."

"Now imagine," says Commander Statham, "a chain of vessels, 60 miles apart; only five would be necessary to communicate some vital piece of intelligence from a distance of 300 miles, receive in return their instructions, and act immediately, all in the course of half an hour or less. This is possible already. Doubtless a vast deal more will be done in a year or two, or less, and, meanwhile, the authorities should be making all necessary arrangements for the universal application of wireless telegraphy in the navy. The outfit is not expensive; £120 would probably fit up any ship, and it is sure to become cheaper in time."

An Electric Hair Curler.

The feminine element *must* have its hair curled. The ancient poker, heated in the grate, was replaced by tongs and curlers of various kinds to be heated in gas flames, and at last the electric heater for such irons made its appearance. Here is the newest thing, the Onota hair curler, made by James S. Barron & Company, of 24 Hudson street, New York city. The machine consists of the curler proper, seven feet of flexible twin conductor cable and an attachment plug, all ready for attaching to an ordinary lamp socket When the current is turned on the proper temperature is attained in a short time and is maintained until the current is turned off, no matter how long the curler may be in use. It is said that it can be used with the assurance that it will not burn the hair, that it is entirely safe and there are no parts liable to get out of order.

An Electric Hair Curler.

Fight with Locomotives.

The locomotive as a weapon for offence and battery promises some novel situations to the novelists in search of new color for a thrilling work, says *Industries and Iron*. At the Cyfarthfa Steel Works of Messrs. Crawshay Brothers, near Merthyr Tydfil, Wales, are some locomotives driven by very cantankerous drivers. The other day one of these left his engine to get coal. While thus engaged another driver came along and requested that the first locomotive should be moved away so that he could pass over the crossing to a water tank. Receiving refusal, he attempted with his engine to move the obstructive locomotive, whereupon engineman No. 1 mounted to his place, put on steam, and drove the aggressive engine back. The latter then charged forward; but, according to the police court report of the subsequent proceedings, got the worst of it. A third charge, however, resulted in the engine driven by engineman No. 1 being sent off the rails. He has been committed for trial for endangering the safety of the public, his defence being that he did not commence the battle. But there was a conflict—of a kind very unusual.

Wall Street and the Electrical Stock Market.

The comparative stringency in the money market and the unsettled state of affairs in South Africa have tended to cloud the situation in Wall street during the current week. Aside from these facts, many strong elements are evident in the market. The stock market for the week has been apparently unaffected to any great extent by favorable or unfavorable occurrences. Therefore, small changes in prices have occurred. It is to be assumed from this that present prices reflect a general and adequate value of securities liable to be affected by circumstances such as have been mentioned above.

On the New York Stock Exchange General Electric closed the week at 122½ bid and 123 asked, showing a loss of 2 points for the week. Metropolitan Street Railway, of New York, closed at 210½ bid and 211 asked, a gain of 3 points for the week. Third Avenue Railroad, of New York, closed at 185 bid and 186 asked, a gain of 1 point for the week. Brooklyn Rapid Transit closed at 104 bid and 104¼ asked, showing a loss of ¼ point for the week.

On the Boston exchange American Bell Telephone closed at 359 bid and no asked price, a loss of 4 points in the bid price for the week. Erie Telephone closed at 104½ bid and 105 asked, a gain of 2 points for the week.

On the Philadelphia exchange Electric Storage Battery common closed at 135 bid and 145 asked, a loss of 5 points for the week. Union Traction closed at 41⅜ bid and 41⅝ asked, indicating no change for the week.

On the curb or outside market in New York Electric Vehicle closed at 104 bid and 108 asked, a loss of 1 point for the week. Electric Boat closed at 20 bid and 25 asked, a rise of 5 points for the week.

Wall Street, September 9.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

DELTA, OHIO—The Delta Home Telephone Company has been incorporated; capital stock, $10,000.

KANSAS CITY, MO.—The articles of incorporation of the Kansas City Mutual Telephone Company, which wants a franchise in Kansas City, have been filed. The capital stock of the company is placed at $500,000, and is fully subscribed for.

VINCENNES, IND.—The Vincennes Electric Lighting Company has been incorporated to construct and operate electric light plant; capital, $75,000; incorporators, J. H. Brown, G. Mayer, R. O. Mayer.

OTTERBEIN, IND.—The Otterbein Telephone Company has been incorporated; capital, $10,000; incorporators, L. Leanning, I. E. Sovitzer, R. H. Bell, all of Otterbein.

COVINGTON, IND.—The Covington & Coal Creek Telephone Company has been incorporated; capital, $10,000; incorporators, A. P. Burnsides, E. C. Snoddes, A. Shaw, C. Marlatt, J. Rhodes, all of Covington.

ENNIS, TEX.—The Southwestern Telegraph and Telephone Company has just completed the telephone service lines to Telico, and now that place has telephone connection with the outside world.

KNOXVILLE, TENN. — Knoxville and Chattanooga capitalists will organize the Chattanooga Telephone Company, with $150,000 capital. It will operate an independent exchange in Chattanooga, in opposition to the East Tennessee company, which operates under the Bell patents, and will also operate toll lines into North Georgia and connect with the East Tennessee lines of the People's Telephone Company, of this city.

WINCHESTER, TENN.—The line of the East Tennessee Telephone Company, from Tracy City to South Pittsburg, has been completed, and Winchester is now in connection with Chattanooga and other southern points.

BATAVIA, N. Y.—The Bell Telephone Company is to extend its lines to Johnsonburg, Java and North Java.

SOMERSET, KY. — The Somerset Telephone Company has just completed a new metallic long-distance line from this place to Stanford, where they connect with Lexington, Danville and Louisville. The new line gives Somerset connection with all of the Bluegrass towns. A. D. Shotwell, president of the Somerset Telephone Company, contemplates building several hundred miles of telephone line east of this place, connecting with Middleburg, Pineville and eastern Kentucky.

DUNKIRK, N. Y.—The Westfield Telephone Company is extending its lines to Brocton and Mayville.

CENTERVILLE, IND.—A telephone company is being formed at this place to be operated in connection with the plant of the Home Telephone Company, of Richmond.

New Electric Railways.

RACINE, WIS.—Waterford, one of the leading towns of Racine County, is to have an electric railway carrying passengers, freight and express matter. The line will run from Milwaukee to Waterford, thence to Brown's Lake, Burlington and down to Lake Geneva, touching all the towns and resorts on the way. The survey has been made and the tracks will run through fields to the right of the highways. Application has been made for franchise through Burlington and Lake Geneva.

READING, PA.—A charter has been procured for the construction of an electric railway between this city and Millmont, a southwestern suburb.

PENN YAN, PA.—It is reported that the Penn Yan, Keuka Park & Branchport Electric Railroad is contemplating extending its line to Pulteney, and, according to the report, will commence the erection of the road this Fall, providing the right of way can be secured.

ALLEGAN, MICH.—A company has been formed to build an electric railroad from this place to Saugatuck, and the work of securing the necessary franchises and right of way will be begun immediately.

HAVERHILL, MASS.—A company is being organized to build an electric road between this place, Georgetown and Danvers. The new company will take the place of one recently organized under a special charter. Capital will be $120,000.

HAMILTON, OHIO—The Hamilton & Lebanon Electric Railway Company has been incorporated; capital stock, $10,000.

CANTON, MASS.—Col. John J. Whipple, ex-Selectman Raymond S. Byam, Messrs. H. L. Johnson, Fred C. Hinds and George W. Weatherbee, representing the Brockton, Canton & Dedham Street Railway Company, have been granted a franchise to build and operate a line of electric railroad in Canton. The proposed route will be from Stoughton line in Canton, through Pleasant street to Washington street, to Dedham street, to Westwood line. The line will form an outlet to Boston via Dedham.

GREENSBURG, PA.—Rights of way have been granted for an electric car line at New Kensington. The road is to be about seven miles long and will touch Parnassus, Arnold, Creighton and Springdale. It is said that it is the purpose to extend the line to Pittsburgh finally.

COLUMBUS, GA.—The Central Railway has let the contract for the extension of its line from Columbia, Ala., to Dothan, Ala., 18 miles, to Hardaway, Jones & Company, the same firm which is building its Mobile & Girard extension. The work begins in 30 days.

TAUNTON, MASS.—A meeting will be held in a few days to form an electric street railway company, to run a line connecting with the Taunton Street Railway by the Winnecunnet Pond section to Easton, a distance of seven and one-half miles, and connecting there with the Brockton line for Boston.

TRENTON, N. J.—The Trenton Street Railway Company, which has been unable to get a franchise to extend its trolley line into Princeton, has organized a separate company, the Mercer County Traction Company, and will build from Lawrenceville to Princeton over private land. The company now has a line as far as Lawrenceville.

BROCTON, N. Y.—Anthony Schmidt, Jr., of Buffalo, representing a party of Buffalo capitalists, has applied for a trolley road franchise in this village.

New Incorporations.

CHICAGO, ILL. — The Guarantee Electric Company has been incorporated to manufacture electrical appliances and supplies; capital, $50,000; incorporators, R. S. Wait, H. W. Hawkins, C. L. Hawley, all of Chicago.

WAVERLY, TENN.—The Humphrey County Telephone Company has been incorporated to manufacture electricity, construct and operate telephone lines; capital, $1,000; incorporators, C. M. Stribling, F. P. Gould, R. A. Jackson, W. H. McCauley, J. A. Box, all of Waverly.

CHICAGO, ILL.—The Continental Electric Telephone Company has been incorporated to manufacture telephone and electrical apparatus; capital, $50,000; incorporators, G. F. Stitet, T. Lidberg, A. I. Coyne, all of Chicago.

MILWAUKEE, WIS.—The Johnson Service Company has been incorporated, with a capital stock of $300,000.

SCHENECTADY, N. Y.—The Australian General Electric Company has been incorporated, with a capital of $50,000. The purposes for which it is formed are buying, selling and leasing electrical apparatus, machines, engines and contracting to do general electrical work in the United States and Australia and other foreign countries. The directors are Edgar A. Carolan, Edward Clark, James A. Carr, Henry W. Darling, Harold Footman, Elmer E. Gilbert and Myron F. Westover.

PAINTED POST, N. Y.—The Imperial Engine Company has been formed, with a capital stock of $20,000. Directors, Chas. M. Morse, J. R. Rand, Jr., and F. W. Parsons.

Increase of Capital.

TRENTON, N. J.—The New York Air Brake Company has increased its capital stock from $5,000,000 to $10,000,000.

PLYMOUTH, MASS.—The Plymouth & Sandwich Street Railway Company has increased its capital stock to $20,000.

CHICAGO, ILL. — The New York Electro-Plating Works has certified to an increase in capital stock from $2,000 to $3,000, and to a change of name to Union Manufacturing Company.

MENTOR, OHIO—The Mentor Telephone Company has increased its capital stock from $2,500 to $5,000.

PHILADELPHIA, PA. — The Diamond State Construction Company has increased its capital stock from $100,000 to $1,000,000, for the purpose of constructing a trolley line in Delaware. Philadelphia and Dover capitalists are interested in the work. Milford and Woodland Beach will be connected when the line is completed.

Electric Light and Power.

SPRINGFIELD, ILL.—The Quincy Light and Power Company and the Empire Light and Power Company, of Quincy, Ill., have filed a certificate of consolidation under the name of the Quincy Gas and Electric Company.

COLUMBUS, OHIO—The Richmond Light, Heat and Power Company has been incorporated; capital stock, $5,000.

MADRID, IOWA—The Madrid Electric Light and Power Company has been incorporated. It has a capital stock of $10,000. A. P. Wosterbery, J. W. Near, A. R Wosterbery, J. G. Hammond, J. W. Carlson, C. G. Johnson, J. P. A. Anderson and Oscar Oakleaf, incorporators.

PORTAGE, WIS.—The new electric light plant at Columbus, this county, is almost ready to be put in operation. The streets of the city will be lighted by 50 arc lights of 1,200 candlepower. More than 1,000 incandescent lights have been contracted for by private parties.

TRADE NOTES.

The H. E. Plass Electrical Construction and Supply Company, 23 Barclay street, New York city, is manufacturing a number of specialties, such as miniature motors, electric batteries, private telephone lines and other unique electrical novelties.

William Roche, of 42 Vesey street, New York city, has again been compelled to enlarge his quarters for the manufacture of the "New Standard Dry Battery," owing to increase of business. He now has two large lofts and a cellar in use, and has tripled his working force. The batteries he is now manufacturing consist of many sizes, running from one half inch to four inches in diameter.

"Where Gush the Geysers" is the title of a pamphlet issued by the Oregon Short Line Railroad. It describes the Yellowstone National Park, and tells how and when to visit it. The pamphlet contains some of the handsomest half-tone color printing the ELECTRICAL REVIEW has ever seen. It may be obtained from Mr. D. E. Burley, general passenger and ticket agent of the road, whose headquarters are at Salt Lake City, Utah.

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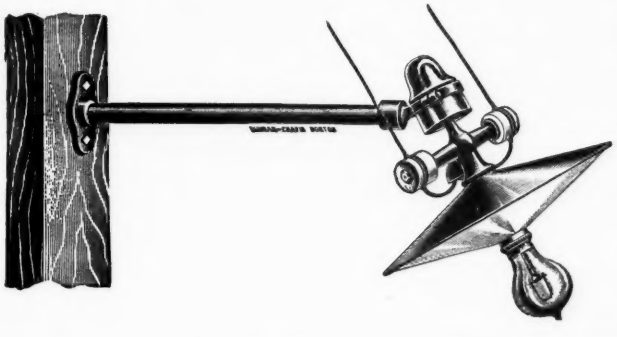

HIGH-TENSION STREET FIXTURES.

OUR NEW HIGH-TENSION STREET FIXTURE is as perfectly insulated as any part of a circuit, the head being separated from the supporting arm by a double petticoat glass insulator.

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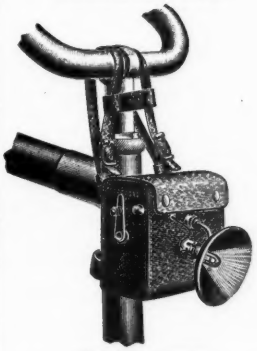

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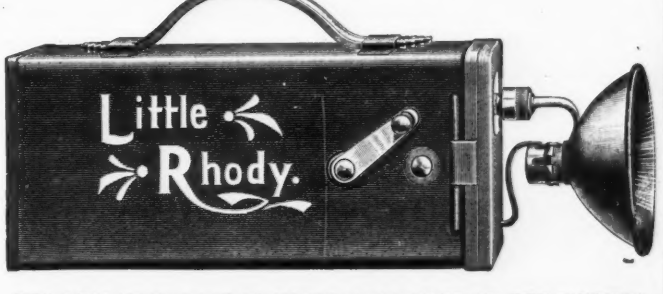

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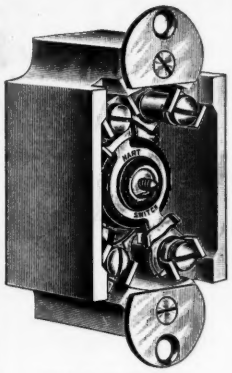

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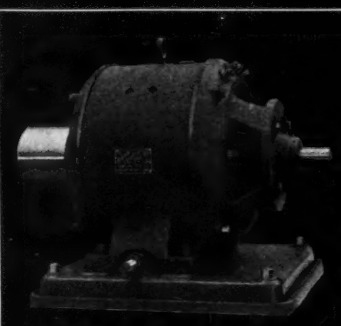

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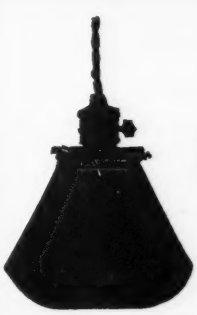

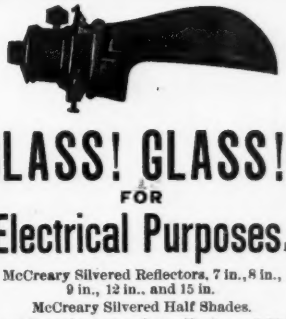

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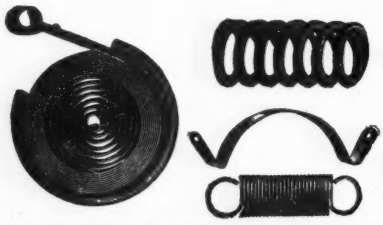

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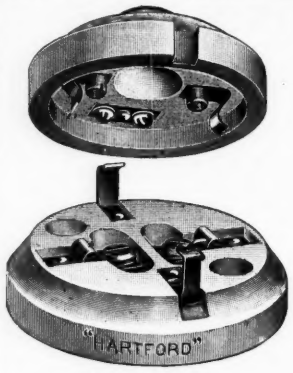

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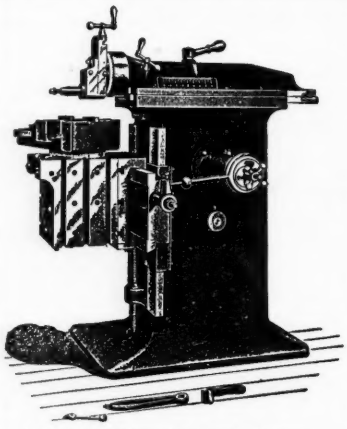
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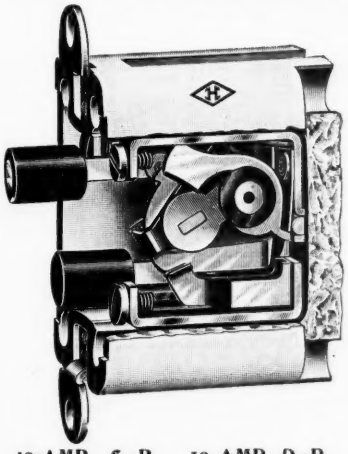

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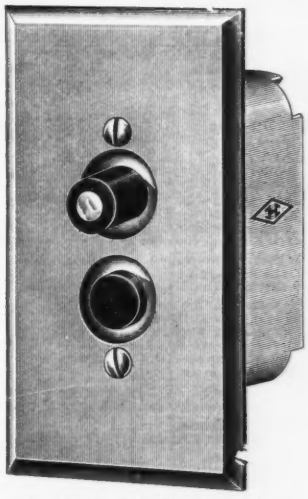

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Alternators.
General Electric Co.
Siemens & Halske Electric Co.
Westinghouse Electric & Mfg. Co.

Batteries, Primary.
Bunnell & Co., J. H.

Batteries, Storage.
American Battery Co.
Electric Storage Battery Co

Battery Material.
Bunnell & Co., J. H.

Bells.
Ostrander & Co., W. R

Belt Dressing.
Dixon Crucible Co., Joseph

Boilers.
Babcock & Wilcox Co., The
Stirling Co., The

Books, Technical.
Electrical Review Pub. Co.

Braiding Machines.
New England Butt Co.

Brokers.
Faris & Thayer.
Greene, B. E.

Brushes, Dynamo.
Galvanic Metal Paper Co.
Goldmark & Wallace.
Hobart Electric Mfg. Co.
Ohio Electric Specialty Mfg. Co
Partridge Carbon Co.

Cable Hangers.
Standard Underground Cable Co

Cabling Machines.
New England Butt Co.

Carbon Points.
General Incandescent Arc Light Co.
National Carbon Co.
Reisinger, Hugo.

Castings.
New England Butt Co.

Circuit-Breakers.
Ward Leonard Electric Co.

Coal Mining Machinery.
General Electric Co.

Commutator Bars and Repairing.
Forest City Electric Works.

Commutator Lubricant.
Allen & Co., L. B.
Mona Manufacturing Co.
Ohio Electric Specialty Mfg. Co.

Condensers (Electric)
Marshall, Wm

Conduits.
American Vitrified Conduit Co.
Camp Co., H. B.
Michigan Pipe Co.
National Conduit & Cable Co
Wyckoff Creosoting Co.

Connectors and Terminals.
McIntire Co., The C

Cord Electric.
Samson Cordage Works.

Contractors.
Webster, Geo. G.

Drop Forged Commutator Bars.
Billings & Spencer Co.

Dynamos and Motors.
Bullock Electric Mfg. Co.
Central Electric Co.
General Electric Co.
General Incandescent Arc Light Co.
Siemens & Halske Electric Co.
Westinghouse Electric & Mfg. Co.

Electric Locomotives.
General Electric Co.

Electric Novelties.
Ohio Electric Works.

Electric Heaters.
American Electrical Heater Co.

Electrical Instruments.
Bossert Electric Construction Co.
Central Electric Co.
General Electric Co.
General Incandescent Arc Light Co.
Keystone Electrical Instrument Co.
Whitney Electrical Instrument Co.

Electric Soldering Irons.
American Electrical Heater Co.

Electric Launches.
Sterling & Co., C. B.

Electrical Supplies.
Bibber-White Co.
Bunnell & Co., J. H.
Central Electric Co.
Electric Appliance Co.
Jones, J., & Son.
Novelty Electric Co.
Ohio Electric Works.
Stewart, Frank H., & Co.
Western Electric Co.

Electromobiles.
American Electric Vehicle Co.

Engineers and Contractors.
New England Engineering Co.
White & Co., J. G.

Engines.
American Engine Co.
Ball & Wood Co.

Fans and Fan Motors.
Central Electric Co.
Diehl Mfg. Co.
Emerson Electric Mfg. Co.
General Electric Co.
General Incandescent Arc Light Co.
Paragon Fan & Motor Co.
Warren Electric & Specialty Co

Fiber.
Kartavert Mfg. Co.

Fixtures, Gas and Electric.
McKenney & Waterbury.

Fuse Wire and Links.
General Electric Co.
McIntire Co., The C.

Globes, Shades, Etc.
Frink, I. P.
Pairpoint Mfg. Co.
Phœnix Glass Co.

Graphite.
Dixon Crucible Co., Jos

House Goods.
Central Electric Co.
Ostrander & Co., W. R.

Instruments (Testing and Recording.)
Bristol Co., The
General Electric Co.
General Incandescent Arc Light Co.
Knott Apparatus Co., E.
Machado & Roller.
Keystone Electrical Instrument Co.
Westinghouse Electric & Mfg. Co.
Whitney Electrical Instrument Co.

Insulators and Insulating Material.
Central Electric Co.
Empire China Works.
Kartavert Mfg. Co.
Standard Paint Co.
Standard Underground Cable Co.
Sterling Supply & Mfg. Co.

Junction Boxes.
Bossert Electric Construction Co.
General Incandescent Arc Light Co.
Ward Leonard Electric Co.

Lamps, Arc.
Central Electric Co.
Diehl Mfg. Co.
General Electric Co.
General Incandescent Arc Light Co.
Standard Thermometer & Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

Lamps, Decorative.
Central Electric Co.
General Incandescent Arc Light Co.

Lamps, Incandescent.
American Endoscopic Co.
Buckeye Electric Co.
General Electric Co.
General Incandescent Arc Light Co.
Hardy Lamp Works.
New York & Ohio Co.
Ohio Electric Works.
Sawyer-Man Electric Co.
Shelby Electric Co.
Sperry, B. N.
Westinghouse Electric & Mfg. Co.

Lightning Arresters.
General Electric Co.
McIntosh, Jas. D.
Westinghouse Electric & Mfg. Co.

Machine Tools.
Garvin Machine Co.

Mast-Arms.
Brady, T. H
Meserve, F. W.

Meters.
Fort Wayne Electric Works.
Siemens & Halske Electric Co.

Mica.
Munsell, Eugene.

Paint.
Standard Paint Co.

Patent Solicitors.
Duvall, Edw. S.
Thornberry, Henry S.

Platinum.
Baker & Co.

Poles, Brackets, Pins, Etc.
Central Electric Co.
Central Mfg. Co.

Porcelain Manufacturers.
Empire China Works.

Rail Bonds.
Forest City Electric Co.
Morris Electric Co.
Roebling's Sons Co., John A.

Railway Specialties (Electric).
Central Electric Co.
Electric Appliance Company.
General Electric Co.
Novelty Electric Co.
Sterling Supply and Mfg. Co.
Western Electric Co.
Westinghouse Elec. and Mfg. Co.

Reflectors.
Frink, I. P.
Pairpoint Mfg. Co.
Wheeler Reflector Co.

Rheostats.
Chicago Rheostat Co.
Cutler-Hammer Mfg. Co.
General Incandescent Arc Light Co.
Ohio Electric Specialty Mfg. Co.
Ward Leonard Electric Co.

Schools.
American School of Correspondence.
Electrical Engineer Institute of Correspondence Instruction.
International Corresp. Schools
United Correspondence Schools.

Soldering Sticks.
Allen & Co., L. B.

Specialties.
G. & E. Electric Co.
General Incandescent Arc Light Co.
Ohio Electric Works.

Steel Spring Wire.
Boker & Co., Hermann.
Cary Spring Works
Manross, F. A.

Storage Batteries.
American Battery Co.
Electric Storage Battery Co.

Switchboards.
Bossert Electric Construction Co.
Central Electric Co.
General Electric Co.
General Incandescent Arc Light Co.
Large & Co.
Western Electric Co.

Switches, Etc.
Central Electric Co.
General Electric Co.
General Incandescent Arc Light Co.

Switches, Etc.
Hart & Hegeman Mfg. Co.
Hart Mfg. Co.
Jones & Son, J.
Paiste Co., H. T.

Telephones.
American Bell Telephone Co.
American Elec. Telephone Co.
Bunnell & Co., J. H.
Central Electric Co.
Central Telephone & Electric Co.
Connecticut Telephone & Electric Co.
Couch & Seeley Co.
Eureka Electric Co.
Farr Telephone & Construction Supply Co.
Gordon, A. Y.
Mianus Electric Co.
National Automatic Telephone Co.
New York Telephone Co.
North Electric Co.
Ohio Electric Works.
Reliable Electric Mfg. Co.
Sterling Electric Co.
Stromberg-Carlson Telegraph Mfg. Co
Taber & Mayer.
Telephone Mfg. Co.
Viaduct Mfg. Co.
Western Electric Co.
Western Telephone Construction Co.
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Tools.
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Transformers.
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Lombard Water-Wheel Gov. Co.

Voltage Regulators.
Belknap Motor Co.

Water-Wheels.
Leffel & Co., Jas.
Lombard Water-Wheel Gov. Co.

Wires and Cables.
American Electrical Works.
Central Electric Co.
Crefeld Electrical Works.
Eastern Electric Cable Co.
Electric Appliance Company.
General Electric Co.
India Rubber & Gutta Percha Insulating Co.
Montauk Multiphase Cable Co.
Moore, Alfred F.
National Conduit & Cable Co.
National India Rubber Co.
New York Insulated Wire Co.
Novelty Electric Co.
Okonite Co., The.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Simplex Electrical Co.
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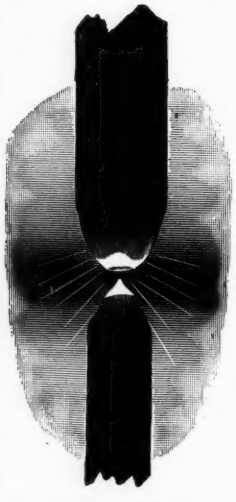

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